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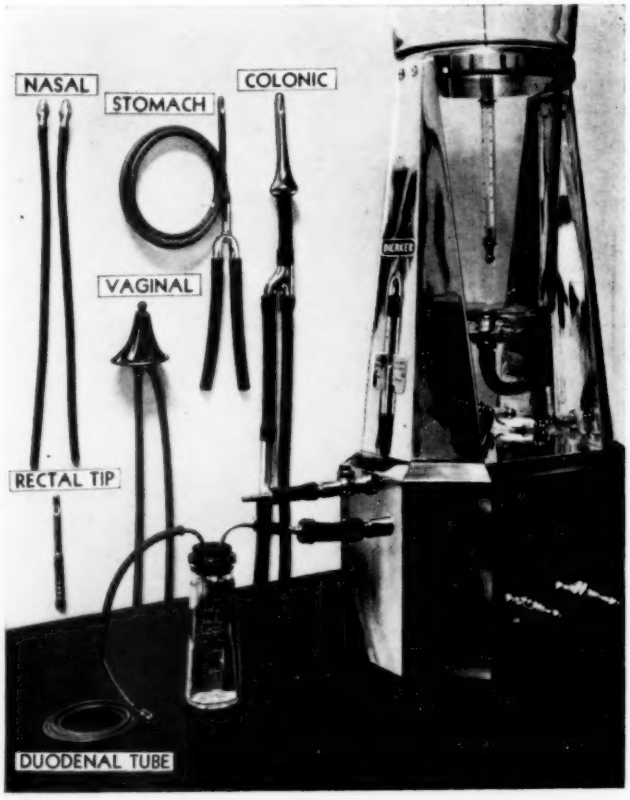

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CONSERVATIVE METHOD OF TREATMENT OF TRIGEMINAL NEURALGIA *

(Preliminary Report)

BENJAMIN ULANSKI, M.D.

PHILADELPHIA, PA.

The intractable character of tic douloureux, and the great number of therapeutic measures devised for its relief, few of which have survived any prolonged use justify the earnest consideration of any additional measures that may be proposed from time to time for its amelioration. A brief review of the various procedures for the relief of this condition may be given for the purpose of demonstrating their relative ineffectiveness and of affording us the opportunity for the presentation of a new therapeutic procedure. The methods of treatment that have been and are being used are the operative and the non-operative. The non-operative, or medical treatment is subdivided into internal and external.

The medical treatment is as comprehensive as it is varied. It covers the oral or parenteral administration of such preparations as quinin, arsenic, gelsemium, aconite, antipyrin, phenacetin, cannabis indica, nitroglycerin, atropin, bromides, salicylates, strychnin, castor oil, pilocarpin, morphin, the barbiturates, and the like.

External medication embraces heat, cold, vesication, liniments, ethyl chlorid spray, inhalation of trichlorethylene, massage, electrolysis, ionization, x-ray, cauterization, galvanism, diathermy and similar applications. Their ineffectiveness is shown by the fact that many patients have even sought aid from such borderline practices as osteopathy, hypnotism, Christian Science, and similar vagaries.

Among the surgical procedures the endoneural injection of alcohol or of osmic acid has proved of only temporary relief. While avulsion or resection, especially of the Gasserian ganglion is in the hands of competent surgeons curative, most patients dread any operative intervention involving or close to the brain, and will go to any lengths to avoid such heroic measures. Though the mortality is comparatively low one has also to take into consideration prolonged postoperative complications of a rather annoying nature.

Surgical treatment is usually the ultimate resort in the care of these cases. All aim at severing the connection of the nerve trunk, over which the pain and distress are experienced, from its central attachment — in the most accessible part of its course. This accessibility naturally varies with the surgical knowledge and ability of the individual operator. The McKechnie operation which is confined to the removal of the superior cervical ganglion does not come within the classification of operations directly on the nerve. With the improvement in technic the mortality of these operations has been greatly reduced as well as many of the annoying post-operative phenomena, but even in the successful cases where no undue mutilation of the nerve has taken place, the array of distressing paresthetic symptoms that ensue is still sufficiently great to justify caution in hastily recommending surgical treatment for this condition.

For the past ten years we have been using a certain form of electricity for the relief of pain in various nerve affections, as reported elsewhere by

* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 11, 1936; and before the regular meeting of the Jefferson Hospital Staff, May 31, 1935; and the Philadelphia County Medical Society, February 19, 1936.

the writer. This form of electricity is a modification of the so-called "rapid" sinusoidal current. The rapid sinusoidal current is an alternating current, a voltage tracing of which would show as many positive and negative sines as there are cycles per second. Each positive phase is immediately succeeded by a negative phase of equal intensity, therefore, the rapid sinusoidal current displays no polarity effects.

This type of current possesses decided pain relieving qualities. Favorable results obtained with it in sciatica and other forms of neuritis and neuralgia have suggested its application also for trigeminal neuralgia of both the major and minor forms.

It has been our privilege to treat cases in their incipiency as well as those which have been previously treated by other methods. Our first experience was in the case of a man, aged sixty, who had suffered for a number of years, and had various forms of treatment, including operative procedures, without relief. We were at a loss how to give the man relief from his pain, and experimentally applied the rapid sinusoidal current. The result of this procedure was the complete cessation of pain for one year, with a recurrence the following winter. He was then given a few additional treatments, which were followed by another period of relief. Sixty-five other cases have since been treated with only nine failures. The period of relief varied from a few months to three or more years, with immediate response to repetition of treatment on the return of pain. Of these sixty-five cases, the majority were referred by the Neurological and Surgical Departments of the Jefferson Hospital.

Case Histories

Case reports of a few of the patients treated are hereby submitted briefly.

Case 1. — Mrs. H. G., housewife, aged 60, seen February 21, 1933; referred by Dr. G. of Jefferson Hospital. In the winter of 1933, twelve hours after a visit to a dentist and preparation of a tooth for filling, there developed pain and swelling on the right side of face. Twenty-four hours later the tooth was extracted. The swelling subsided, but the pain which was at first dull in character became sharp, lancinating and boring, occurring in spasms and lasting about one-half minute. Pain began in the middle of the chin, radiating to the temple. Trigger zone over mental foramen. These attacks were brought on by movements of the jaw, sneezing, coughing, talking, drafts, heat and cold. The pain was treated by her husband, who is a physician. She was then seen by Dr. D. in consultation, who confirmed a diagnosis of tic douloureux, 2nd and 3rd divisions. The patient was given treatment with definite relief from pain after the second seance and complete relief from the pain after the fifth session. She was free from pain until the spring of 1935, when she had a recurrence on the right side of the face, but not as severe as the first attack. She again received 6 treatments with the rapid sinusoidal current with cessation of symptoms.

Case 2. — Mrs. L. W., housewife, aged 45, seen October 11, 1932; referred by Dr. W. of N. S. Hospital. In October, 1928, the patient developed Bell's palsy of the left side of face, and was treated with complete recovery. In October, 1932, while on a boat she was drenched with water, following which she developed a toothache. The pain continued, and it was sharp like an electric shock. It continued in spasms of half a minute or so, recurring often during waking hours. Spasms were brought on by movement of the jaw, talking or eating. The pain was distributed over the 2nd and 3rd divisions of the right side, with trigger zone about the mental foramen, and upper 2nd incisor on right side. She was treated with the rapid sinusoidal current, and experienced relief after the first few treatments. She continued treatments for about one month and then was discharged free from pain. On May 22, 1935, three years after the first attack, she began to complain of pain on the right side of face, which was of the same character as the first attack, but not as severe. She was treated on May 23 with an improvement of seventy-five per cent. Further treatments were given May 24, 28 and 29 on which date she was discharged with freedom from pain.

Case 3. — Mrs. C. S., married, aged 55, seen July 55, 1935; referred by Dr. D. of Jefferson Hospital. Four years ago she developed sudden sharp pain on right side of face beginning at about first incisor, lower jaw shooting up into head. Also

at upper lip at right side of nose shooting up into eye. Definite trigger zones; over first incisor lower jaw, and right side near tip of nose. Pain is sharp, lancinating, boring, appearing in spasms. Lasts about one-half minute on and off during waking hours. Previous treatment: Internal medication and two alcohol injections with no relief. Was under our care for three weeks during which time she received 9 treatments of rapid sinusoidal current and short wave diathermy. Discharged free from pain.

Case 4. — Mrs. M. F., housewife, aged 48, seen February 13, 1935; referred by Dr. D. of Jefferson Hospital. Chief complaint — pain radiating, piercing, boring on left side of face. Region of second lower incisor. Pain extends into head. Condition existed on and off for the past eight years. Trigger zones are second lower incisor on left side, and left corner of mouth. Pain exaggerated when under emotional strain. Attacks are brought on by talking, eating, cold. Neurologic findings, negative. Previous treatment: Internal medication and one alcohol injection in 1935 with no results. Patient received 8 treatments of rapid sinusoidal current and short wave diathermy. These treatments were administered every other day and resulted in relief.

We have been so impressed with the almost instant relief from pain and the uniformity of results obtained, that we feel this method of treatment warrants the present preliminary report to stimulate further investigation. We are unable, at the present time, to state on what scientific basis this treatment rests. Several physiologic processes have come to mind, and it is our purpose to pursue this subject further with the hope that we may be able to elicit the underlying factor.

1737 Chestnut Street.

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LUMBOSACRAL DERANGEMENT AND ITS MANIPULATIVE TREATMENT *

B. S. TROEDSSON, M.D.
BRYN MAWR, PA.

In recent years many papers have called attention to the lumbosacral region as the seat of certain disabling low back conditions. As a result of that emphasis the diagnosis of low back pain or backache is being modified and substituted by clinical entities. Thus there has been evolved the conception of prespondylolisthesis, spondylolisthesis, reduced lumbosacral joint space, and "the facet syndrome." The cases to be described here appear similar to the last group, as described by Ghormley. He believes that in his cases the trouble is located in the inferior articulations of the lumbosacral articulation and also that manipulation may relieve the pain that is present. Ghormley states:—

> I feel not only that they are causes of sciatic pain, but that they may be causes of lumbosacral pain with or without sciatic pain. Particularly those patients who complain of sudden onset of pain low in the back, brought on by some activity often trifling in its severity but usually involving a twisting or rotary strain of the lumbosacral region, are in all probability, usually victims of the facet syndrome. These patients often present sciatic scoliosis, which may be homolateral, contralateral, or alternating. With the onset of sciatic scoliosis, muscle spasm sets in, and this although splinting in action, forces the irritated surfaces of the facets together more firmly. Until this muscle spasm subsides or some changes in position of the surfaces of the facets takes place, as by manipulation, the pain may persist.

Ghormley presents an admirable survey of the literature dealing with the inferior articular processes of the fifth lumbar vertebra and points out the importance of these articulations. The reader is referred to his article and to those of von Lackum, Danforth and Wilson, Putti, and Ayers to get an accurate anatomic picture of the lumbosacral region. From a functional standpoint it is important to emphasize that the stability of this area in a stooping or lifting position is to the greatest extent dependent upon the tropism of the articular facets and the direction of the articular processes of the fifth lumbar vertebra. To understand this easily one must go back to comparative anatomy. In the quadruped the superior articular facets of the sacrum lie in the horizontal plane and receive the inferior articular processes of the fifth lumbar vertebra. This overlapping gives a very effective bony support to the body weight at the sacral end as it hangs between the shoulder and the pelvic girdles. The arrangement in the quadruped at the sacrum is similar to that seen between the 4th and 5th lumbar vertebrae in figure 1, where D gives a very effective bony support to any downward pull on B. With the assumption of the erect posture in man and a consequent great loss of weightbearing function for these processes, there has been a change in their direction as well as in the direction of their articular facets. Miltner and Lowendorf found tropism of the lumbar articulations in 70 per cent of 200 cases x-rayed for sacroiliac and lumbosacral sprain. Only 30 per cent showed so-called normal planes. Figure 2 is a copy of one of their drawings illustrating tropism in the lumbosacral area. With this spine in the horizontal position there is no bony support for a downward pull at D. Slipping, followed by a locking, could easily take place at this point. Figure 2

* Read at the Fifteenth Annual Session of the American Congress of Physical Therapy, New York City, September 8, 1936.
* From the Physical Therapy Department, Bryn Mawr Hospital.

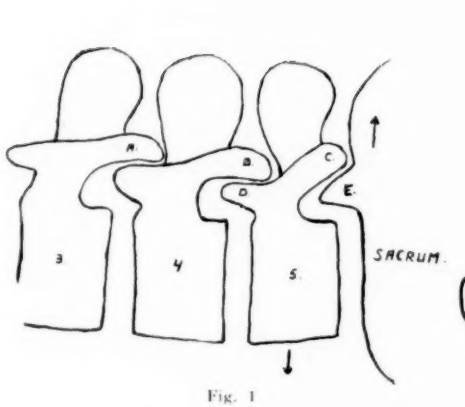

Fig. 1

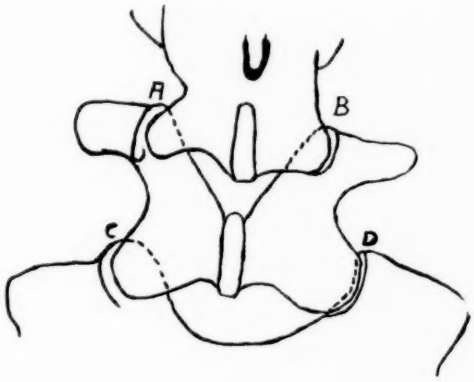

Fig. 2

Fig. 1. — Tracing of lateral x-ray picture of the lumbosacral region in a human spine. The picture has been turned into the horizontal position for purposes of illustration. Processes A and B rest on good bony support. Process or processes C will have a tendency to slide. This tendency will be great when there is an upward pull on the sacrum as in lifting.

Fig. 2. — Showing the articulations of the fifth lumbar vertebra. Articulations A, B, and C, are for the most part facing an oblique frontal plane, while articulation D faces a sagittal plane. With this spine in the horizontal position there will be no effective bony support at D. [Reproduced from L. J. Miltner and C. S. Lowendorf. *Low Back Pain.* J. B. and J. Surg. **13**:24 (Jan.) 1931.]

on the other hand shows how easily slipping could take place even with the facets in the frontal plane but the inferior articular processes at an angle and thus having poor support.

It is evident that a lumbosacral area showing such changes in adapting itself to the upright position must become a weak point when returning to the quadruped position, especially if the element of weight lifting, rotation or twisting is added. The fact that this region is also the junction of a flexible part, the spine, and of a solid part, the sacrum, increases the weakness and contributes to making this area the breaking point. If the force is great enough it is easy to see that a slipping could take place, uni- or bilaterally, depending upon the tropism of each joint. It must be minute or else we would be able to detect a changed alignment by physical examination or by x-ray. Improved x-ray technics may make this possible in the future.

Symptoms and Treatment

The history and the clinical aspect in patients suffering from this condition present the following picture. They complain that while lifting, bending over, or taking part in any activity involving a stooping position, they experienced a sudden sharp pain in the lower back. It is often described as a snap or a sting at the bottom of the spine or as if something had given away in the back. The severity of the attack varies from a completely crippling nature to one that allows the patient to go on working, after a rest, but at a greatly reduced speed and power. However, with continued activity there is an increase in the pain, sooner or later necessitating medical aid. These patients are found to walk with a shuffling gait, the body bent slightly forward and the lower back held rigid. It is difficult for them to sit down or get up and almost impossible to take off their shoes. On physical examination these patients localize the original injury with its resultant pain directly over the lumbosacral articulations, as in figure 3. The pain is often described as shooting across the back, towards the groin, or down the buttocks, on one or both sides. Palpation discloses only tenderness over the lumbosacral articulations but no actual pathologic changes. Forward bending is limited and very painful. This is best shown when the patient is put

flat on his back and asked to raise his trunk while the examiner holds down the patient's lower extended extremities as in figure 4. Flexion is impossible or becomes so on account of pain at 10-40 degrees. Thighs flex easily on the trunk with the legs also flexed. Compression of the iliac bones has no effect on the pain. X-ray pictures, antero-posterior and lateral views, taken in a number of patients show no lesion to account for the condition.

The treatment employed in this very definite clinical picture has met with uniform success. The patient is put flat on his back on a solid table and asked to brace himself by holding on to its sides. The operator stands at the foot of the table and with a firm grip around one of the patient's ankles proceeds to flex the patient's thigh and leg on the trunk (fig. 5). Then the

Fig. 3

Fig. 4

Fig. 3. — Patient pointing to location of his symptoms and limitations of flexion — a mild condition.
Fig. 4. — Testing body flexion. See text.

patient is told to give a violent kick on command. As the patient kicks, the operator makes a sudden strong pull on the ankle. The direction of the force should be in the body line and at a slight angle with the horizontal plane. The patient's kick and the operator's pull should be coordinated to give a maximum force when the extremity reaches full extension, as in figure 6. Both

Fig. 5

Fig. 6

Fig. 5. — Demonstrating initial step preparatory to sudden forcible extension of lower extremity.
Fig. 6. — End stage of extension with operator exerting pull on ankle.

extremities may be used instead of one. After 2 or 3 such kicks the patient is asked to again flex his trunk on the lower extremities. If before the treatment he was able to do it only up to 10 to 20 degrees, he will now be able to attain 40 to 50 degrees. At the same time he states that his pain has decreased. The treatment is continued until the flexion is free and only a soreness remains in the lumbosacral region. The average treatment requires 5 to 10 kicks. It can readily be seen that with the kick and pull there must be a separation of the sacrum and the lumbar spine. At the same time there is a very distinct forward thrust of the sacrum on the 5th lumbar vertebra, opposite to the direction in which the slipping has taken place. The patient's recovery is so prompt that it is hardly possible to conceive of anything but a reduction having taken place, restoring the joints surfaces to normal position, permitting free motion, and releasing pressure on the nerves as they leave the foramen between the 5th lumbar vertebra and the sacrum, directly anterior to the inferior articular processes.

Interest should under no circumstances end with the relief of the patient from acute pain. Joint capsules and ligaments have been stretched and there may be effusion and swelling around the articulations. Rest, support, heat and massage are required, and should be kept up for at least two weeks or until all soreness has disappeared. There still remains the possibility of new attacks. Recognizing the underlying condition and knowing the cause, any physician can draw up a program of prevention. This should include a warning against the effort that caused the injury, wearing of belts or braces to support the back, exercises to strengthen the back and correction of any faulty posture.

Case Reports

The following cases illustrate the acute condition just described:

Case 1. — McG., age 51, weight 215 lbs., was admitted to Morristown Memorial Hospital, service of Dr. Thomas, in November, 1931. Patient stated that five days previous to admission he had been lifting an iron bed when he suddenly felt a "sting" in his lower back, which became very painful. He had to stop working. For four days he stayed in bed, only occasionally getting up for meals. The back steadily got worse, any motion was painful. It would take him half an hour to put on his trousers. He had had similar attacks on previous occasions when lifting heavy objects. Attacks were getting progressively worse. X-ray pictures had never shown any condition to account for the pain. Generally it would take him four weeks of rest in bed, with the back strapped, followed by physical therapy to get well. The present attack was the worst one he ever had. On examination he was seen to walk leaning slightly forward and with the lower back held rigid. He located "the sting" directly over the lumbosacral region with pain radiating across both iliac crests. Trunk flexion on the extended lower extremities was only 20 degrees. He was given single and double leg kicking 10 times. Following this he could walk and bend over freely. Only "a soreness" remained in the lumbosacral region. He went back to work after 36 hours, the intervening day being a Sunday. For 3 years he continued to do the same heavy work he had been doing without any recurrence of his trouble and the back feeling better than it ever had.

In August, 1934, he had another attack. This followed a "twist" he had received while unwinding a heavy rolled up steel cable. The symptoms were identical with those on the previous occasion. The treatment and the result were also the same.

Case 2. — I. H., colored, age 32, weight 170. Two days previous to admission patient was suddenly seized with a pain in his lower back while lifting some stones. He could not straighten up for some time, had to stop work and lie down. Pain has been getting worse ever since. No previous attacks. On physical examination he located his pain directly over the lumbosacral articulation. Trunk flexion was about 30 degrees. There was no evidence of fracture or dislocation.

With the treatment above described almost complete relief from backache was obtained. Patient could walk freely and was discharged from the hospital immediately.

Case 3. — Patient was lifting a 3-year old baby on the day before and suddenly felt something "snap" at the bottom of her spine. She had to lie down on account of the pain in the back. The next morning she could hardly get out of bed, the pain being very severe

across the lower back and down the back of the left leg. On examination she located her injury over the lumbosacral articulation and complained of pain in the left gluteal region, radiating down the thigh. Trunk flexion was only 15 degrees from the table. She was directed to make 6 mild kicks and improved immediately, being able to put on her shoes which she could not do before. She was told to come back in two days. At that time she stated that the pain across the lower back had entirely gone but there was still some "soreness" in the left hip. She carried out 6 more exercises and was told to return in another two days. Heat and massage were also given. At the next visit she stated that she felt splendid except for a lingering soreness in the left buttock.

CASE 4. — Mrs. C. G., age 22. Obese. One week ago patient was stooping over and lifting a case of beer when she suddenly felt a "pain" in her lower back. It was gradually getting worse. She is unable to work and can only walk a few steps at a time. Getting out of bed in the morning is very difficult and it is impossible to bend over. She has never had any similar attacks. On examination the "pain" is located over lumbosacral articulation, radiating on both sides. She walks with great difficulty and can not bend over. Twelve double leg kicks were ordered with the patient flat on her back on the floor. Following this she stated that the pain was gone. She could bend over freely. Six months later she stated that she had remained well following the treatment.

CASE 5. — F. B., age 33. Weight 150 lbs. Two days previously the patient was shoveling while working on a government project and suddenly felt a pain in lower back. This has been getting worse steadily and now it is impossible for him to work. On examination the patient is seen to walk with a rigid lumbosacral region. Pain and tenderness is present in this area but no radiation of the former. Body flexion is limited to about 20 degrees. After 5 kicks patient stated that his pain was practically gone. He could flex body freely. X-ray pictures, antero-posterior and lateral views, were negative. He was given heat and massage as follow-up treatments. Five days after his initial treatment he stated that his back was "fine." This case was seen together with Dr. Byron G. Sherman of Morristown, N. J., in whose office the follow-up treatments were given. Eleven months later Dr. Sherman states in a personal communication: "I remember the F. B. case very well and the spectacular relief obtained after manipulation in our clinic. I saw him several times after his visit to the clinic and there was no recurrence of his acute symptoms. He did have a moderate degree of 'soreness' for five or six days. I have seen him since then when he had an attack of grippe and still he had no recurrence of his lumbosacral pain."

CASE 6. — J. W. K. Age 61. Weight 165 lbs. Admitted to Bryn Mawr Hospital as a private patient of Dr. H. Taylor. The patient stated that he had always been in perfect health. On the morning of admission he tried to lift an icebox and suddenly heard a "snap" in the region of the "sacrum." He fell back upon the floor and was unable to move at all without the most acute pain in the lower back. He was fairly comfortable when perfectly quiet and had to be brought to the hospital in an ambulance. X-ray pictures were negative.

On examination the patient located the "snap" directly in the lumbosacral area. He could not flex his body because of the pain and could only lift his head from the pillow. Even moving the legs hurt. He was directed to perform a series of very mild kicks and as he improved they were made stronger.

After about ten kicks he could sit up in bed and to his amazement also get out and walk. The patient was kept in the hospital for eight days to get rest and physical therapy and was then discharged. Three months later he stated that his back had remained normal.

CASE 7. — M. T. Age 53. About 3 years ago patient was carrying a sack of potatoes into his cellar. A step broke and he fell on his back, sliding down into the cellar with the sack of potatoes on his chest. He felt a pain in his lower back and was taken to the hospital in an automobile. He stayed in the hospital for four weeks and got better. About four days after his return home he tried to lift a basket of ashes. There was a sudden sting in his lower back and he dropped to the floor, unable to stand up on account of pain. He was brought to the hospital, had the back strapped and then went back home and stayed in bed for three weeks, getting slightly better. His back has troubled him ever since. At times the pain has been not only across his back but also down the left leg and he has had to go to bed.

On examination this patient located his original and present trouble directly over the lumbosacral articulation. Body flexion was only about 30 degrees. The "kicking" treatment was given, following which the patient stated that for the first time in three years he felt well. He could flex his body freely, could don his shoes and trousers, which always before had required the help of a member of his family. A slight residual soreness remained in the lumbosacral region but disappeared in ten days under physical therapy.

This patient had had extensive x-ray examination of his back without revealing any

abnormal condition to account for his trouble. He was seen 5 months later and stated that he was back at work as a tailor.

CASE 8. — C. McC. Age 25. Seen in consultation with Dr. G. Gordon Snyder. This patient had been shoveling snow the day before. While doing this work he felt a little "twinge" at the bottom of the spine. He stopped working for a few minutes and then continued again, feeling slightly better after his rest. In the evening his back felt stiff. The next morning he could hardly get out of bed and it was impossible for him to put on his shoes.

When examined the patient located his trouble over the lumbosacral articulation and a little to the left of the midline. He could not bend over, body flexion being limited to 30 degrees.

Following treatment he could flex his body freely and stated that his pain had practically gone.

CASE 9. — M. J. D. Age 22. This patient was setting up bowling pins after they had been knocked down by the players. While quickly straightening up, after having set up the pins, he felt a sudden sting in his lower back and developed pain making it impossible for him to continue his work. He could not bend over, nor lift anything. This patient located his trouble over the lumbosacral area. Body flexion was limited to about 35 degrees. The treatment and its results were the same as in case history No. 8.

Summary

Nine cases of low back pain are presented. They give a history of sudden onset of low back pain following exertion in a stooping position. The symptoms consist of pain in the lower back and inability to bend over. The signs are tenderness and pain over the lumbosacral region and definite limitation of body flexion. No demonstrable pathologic changes have been detected in the x-rayed cases.

Repeated forcible extension of one or both of the lower extremities, in the manner described, gives prompt relief.

The trouble is believed due to a minute subluxation of one or both of the inferior articular processes of the 5th lumbar vertebra.

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(*For discussions see page 25*)

LOW BACK PAIN *

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A discussion of low back pain should be entered upon with a spirit of humility, for this is a topic upon which no physician in the present state of knowledge has the right to be dogmatic. Therefore at the outset, I wish to emphasize that the theoretic and therapeutic thoughts herein presented are based upon empiricism rather than scientifically demonstrable facts. However, if we view the subject candidly, we find that much of our medical knowledge rests upon a fundamental substratum of empiricism.

The lumbosacral spine and its supporting soft parts constitute a relatively weak portion of the human frame. Perhaps the ascent from the quadrupedal posture is responsible for this weakness, but the fact remains that this unusually mobile section of the spine joining with the fixed pelvic basin is unsuited for the constant and varied strains which it must endure. From an evolutionary standpoint we may perhaps with some justice assume that the final form of the lumbosacral spine has not yet been attained, inasmuch as few parts of the human anatomy are subject to so many and bizarre variations in form and structures in otherwise apparently normal individuals. One need only interpret x-rays taken for conditions not allied with back pain to realize that it would be difficult to establish an absolute norm. We see variations in the planes of the intervertebral facets; we see asymmetry between the intervertebral facets of the same segment. The angle of inclination of the lumbosacral junction in apparently normal individuals varies through an almost incredible range. We see anomalies of the transverse processes, particularly the fifth lumbar vertebra, which vertebra not infrequently assumes the characteristics of an upper sacral segment or similarly, the upper sacral segment assumes the characteristics of a lumbar segment. Failure of fusion of the neural arches in this region produces an extremely high number of cases of occult spina bifida. Various degrees of spondylolisthesis may exist and be detected only on account of circumstantial x-rays taken to diagnose other conditions. An entire monograph could be written on the osseous variations which may be present and asymptomatic, but enough has been indicated to point out that the anatomic conformations of this portion of the body are such as to produce a structure which is frequently mechanically unsound and therefore essentially vulnerable. It might be added that the bony variations are only part of the picture, because soft tissue structural variations must accompany the osseous ones, though this is not easy of demonstration.

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In considering any specific case of the type under discussion, it is not only important to ascertain the history with the usual historical background, but it is equally essential to have an accurate description of the pain characteristics, because the varied types of pain when well described and carefully interpreted may lead as much as any other single observation to a correct diagnosis. We have many patients who complain of pain in the early morning upon awakening. This pain rapidly improves after the patient arises and resumes the day's activities. In contrast is another group in which the pain disappears during the night and approaches a crescendo during the middle or towards the end of the day when the fatigue following activity sets in. The first type is characteristic of the mild chronic arthritic spine, the articulations of which become stiffened during the period of nocturnal recumbency and limber up rapidly when motion is resumed. The second type is most often encountered in the postural backaches proceding from a failure to achieve proper body balance. Certain types of pain, usually those of traumatic and inflammatory origin, are definitely ameliorated by rest and support, while other types of pain, notably those produced by neoplasms react most unfavorably to immobilization. We have the pain which is localized to a definite area with no radiation whatsoever, characteristic of types of trauma involving fractures, and also may characterize localized infections such as solitary abscesses of the vertebral bodies. Conversely we encounter pains which although they may center at some point in the lower back, produce widespread radiations to parts far distant. The interpretation of these radiating pains is frequently an essential diagnostic criterion in the analysis.

Diagnostic Significance of Pain Radiation

In diagnosing back pain the aspect of pain radiation just mentioned is of such importance as to warrant more particular consideration than mere passing comment. The radiation of lower back pain is a phenomenon which frequently misleads even the patient; for the radiating pains may transcend in severity those emanating from the pathological area itself. The nature of some of the radiating pains is not difficult to explain, inasmuch as the proximity of the sensory roots of the spinal nerves to the intervertebral articulation is such as to produce radicular irritation with its concomitant referred pain from even mild affections of the intervertebral articular areas. Consequently it is not uncommon to encounter excruciating peripheral pains in the femoral or sciatic areas, and the presence of these pains should not mislead the physician to such an extent as to divert his attention from the spinal to the peripheral area. Of course when considering such radiating pains it must by no means be forgotten that they may proceed from pressure originating within the spinal canal, and no effort should be neglected to exclude or establish the presence of such intraspinal lesion. For this reason investigation of the presence or absence of bladder and rectal symptoms, the integrity of the sensory distribution and the examination of the deep and superficial reflexes should never be omitted.

One type of reflex pain frequently encountered might be mentioned in particular, inasmuch as the interpretation of this pain is somewhat controversial; this may be termed as the cough-sneeze pain reflex. The patient experiences a severe pain in the lower back upon coughing or sneezing. Some neurologists interpret this as a sign of intraspinal block and consider that all cases presenting this symptom exhibit intraspinal disease. The interpretation which these authorities place upon this phenomenon is, that the cough or sneeze causes a sharp increase in intraspinal pressure which is transmitted down to the block, below which this increase is not transmitted, and the impact at the site of obstruction produces the pain. Although the presence of

this sign should certainly put us on our guard, so that we may exclude intraspinal lesions if possible, the orthopedist does not believe that such block is the sole cause of the cough-sneeze pain reflex. This reflex is characteristic of a large number of acute lower backaches. In fact it is one of the most frequently encountered symptoms and is met with in both the traumatic and non-traumatic type of lower backache. Apart from the above mentioned block it may be caused by the sudden muscle contractions which accompany coughing or sneezing. The mechanism of coughing or sneezing involves not only the chest and diaphragmatic musculature, but also that of the abdomen and lower back. We therefore have transmitted abrupt muscle contractions which produce sudden stresses falling upon the spine.

In considering backache, it is simplest to discuss two chief groups; namely, cases following a definite history of trauma, and those arising spontaneously without a traumatic background. This discussion of course does not include a large group of lower back pains which originate from visceral sources. It is obvious that such visceral backaches must always be kept in mind, but their discussion is somewhat beyond the province of an orthopedic surgeon.

It is surprising in considering the distinctly traumatic backache that the degree of disability produced by any given trauma has no direct relationship to the severity of the physical forces involved in producing such injuries. Extremely mild injuries frequently those involving merely injury by indirect muscle force, may produce pain of extreme intensity. In the lower back more than in almost any other part of the body, it would seem that the manner of application of the force rather than the degree of the force is the dominant factor in a large proportion of these injuries. Fractures involving the transverse processes of the lumbar vertebrae, even mild compression fractures of the bodies of such vertebrae, muscle and fascial tears, and what for want of a better term I would call sacroiliac dysarthroses may all be caused by injuries involving so little impact or muscle strain that one sometimes doubts the etiologic significance of the trauma.

Diagnostic Value of X-Rays

The diagnosis of the traumatic lower back is frequently baffling. Those types which involve definite osseous injury showing roentgenographic changes are easily diagnosed. Here, as in all other types of lower back conditions, the x-ray films should be made only after the lower bowel has been thoroughly cleansed by a mild purgative and an enema, and it is important also to have views in various planes. With such pictures fractures should be readily diagnosed, but unfortunately many of the most troublesome of the traumatic cases yield no x-ray evidence whatsoever. It is however manifestly unfair to conclude from a negative x-ray examination that the patient is neurotic or malingering.

A person for instance on attempting to lift a weight, perhaps of very moderate size, stoops over and upon making the erecting effort has a severe incapacitating pain, which may continue and even increase in severity. Even with negative x-ray findings we have no right to say that an injury does not exist. Such injuries may involve tears in muscular, ligamentous or fascial structures which in themselves are sufficient to produce excruciating pains. Injury to the intervertebral discs may follow trauma of varying degrees and yet be readily overlooked upon x-ray examination.

Sacroiliac Pain

One of the most discussed and highly disputed types of injury in the lower back is that which produces pain referred to the sacroiliac areas. This

injury is usually caused by a strain imposed upon the lower back in the flexed posture. There is a sensation of something giving way which is so definite that the average patient states he "threw something out" in the lower part of his back. Immediately thereafter he is unable to stand erect without great pain. There is pain referred to one or the other sacroiliac region, and frequently, if the pain persists, it exhibits a tendency to extend down the sciatic area. The pain may be of such severity as to necessitate opiates for its control. In short, a relatively mild injury by indirect violence has caused a disabling and excruciating pain. Here, too, x-ray films are of little assistance for diagnosis.

The interpretation of the sacroiliac syndrome is a veritable battle-ground of controversy. A large number of competent authorities categorically deny that a luxation or a subluxation of the sacroiliac joint is possible. They attribute the symptoms entirely to soft tissue injuries or to predisposing fascial inflammations. I feel that a distorsion of this articular area is often present although not demonstrable by x-ray. A luxation in the sense that a hip or shoulder luxates is obviously impossible except in cases of major trauma of such severity as to disrupt the entire pelvic ring. However, if we visualize rather a rotational distorsion in which the one or the other ilium rotates around an axis centered at the sacroiliac articulation, I think that we can explain the difficulty of securing x-ray corroboration. Such a rotation can be frequently inferred by means of a measurement which reveals a definite pelvic asymmetry.

If we measure from the anterior spine to the corresponding malleolus with the anterior spines accurately leveled, we find no disproportion in length of the extremities, but in a case exhibiting rotational sacroiliac distorsion, measurements taken from the anterior superior spine to the opposite malleolus will show definite asymmetry, i.e. although the homo-lateral measurements are symmetrical, the crossed ones are asymmetrical. The explanation of this phenomenon, I think, can be found in the anatomical configuration of the os innominatum. Taking the mid-point of the sacroiliac joint as a center, it will be seen that the acetabulum and the anterior superior spine occupy points on the radius of a circle centered in the sacroiliac area. Both of these points are anterior to the vertical diameter of this circle, so that if the ilium rotates upward and backward upon the sacrum, the acetabulum and the anterior spine are elevated equally, and conversely, when rotation is in the opposite direction, they are depressed equally, so that although the homolateral measurements remain unchanged, the crossed ones become asymmetrical. Restoration of the normal position of the sacroiliac articulation by manipulation reestablishes the symmetry of the crossed measurements. The degree of rotation necessary to produce measurable changes is surprisingly small, and it can be demonstrated on the skeleton that a rotation of one or two degrees, a distorsion which cannot possibly be disclosed on the x-ray films can be detected by means of the crossed measurements above described.

One type of traumatic lower back lesion which frequently escapes diagnosis or which is more often labeled "traumatic neurosis" is the condition known as Kümmel's disease. This may occur following trauma to the spine with or without fracture. It is a progressive rarifying osteitis running a long chronic course extremely disabling and unfortunately presenting so few early signs as to lead to the presumption that the patient is a malingerer or a neurotic. Successive x-ray films, however, will show a progressive decalcification of the vertebral bodies with eventual wedging and collapse, if the process is unchecked. Early treatment is essential, and therefore we must always be on the lookout, lest we miss this somewhat rare but important diagnosis.

Arthritic Backaches

The lower back pain which arises without history of trauma may exhibit either a sudden or a slowly progressive onset. In general, we may say that of the non-traumatic type the most frequent is that arising from chronic arthritis. As has been mentioned before, the backache consecutive to this condition is apt to be most severe in the early morning. It is influenced by changes in the weather, it is extremely prone to exhibit radicular radiations, and is susceptible more than any other type to amelioration by analgesic medication. Of course, we must distinguish carefully between the various types of arthritis, and the above characteristics are met with particularly in the chronic infectious and in the involutional arthritides of the aged.

Among the more acute arthritides following pyogenic and also Neisserian infection, we may encounter extremely fulminating types of spondylitis, and the pain is no longer of the matutinal type, but is constant, frequently with nocturnal exacerbation, and accompanied by febrile manifestations. The gonococcal type after the initial acute onset tends toward chronicity and gradual extension along the vertebral axis.

A tuberculous spondylitis involving the lower spinal segments or the sacroiliac articulations may present a backache of slow and insiduous onset, although at times we do see cases in which the onset has been abrupt. Usually the early gibbus formation and the undue amount of protective muscle spasm give an early hint as to the probable etiology. Nocturnal exacerbations of pain are frequent, and the tendency towards the formation of cold abscesses can be interpreted very early in the x-ray films. All these signs aid in the establishment of at least a presumptive diagnosis.

Charcot's disease of the spine is not to be disregarded as a possible factor in low back pain. Unlike the aspects of this condition in the knee, we are apt to find that it is accompanied by pain, particularly of the radicular type. There is considerable spinal deformation but relatively little protective muscle spasm. The x-ray films are apt to show bizarre destructive distorsions of the vertebral bodies with or without luxation of varying degrees.

Apart from traumatic and inflammatory causes, we have a large group of low back pains which ensue from congenital deformities. Why a deformity will exist asymptomatically for many years, and then produce acutely painful symptoms is difficult to explain. Sacralization of a transverse process of the fifth lumbar vertebra is a not infrequent source of low back pain, and less frequently lumbaralization of the first sacral segment may cause a similar symptom. It is probable that asymmetrical strains set up by these congenital malformations, or varying degrees of arthritis in the false articulations between the abnormal and normal bony structures may be the source of the eventual production of pain.

Spondylolisthesis usually of the fifth lumbar segment upon the sacrum must be classed among the congenital lesions, for the slippage is made possible only on account of a congenital failure of fusion of the vertebral pedicles. This condition is manifest by low back pain, often with marked bilateral radiation, and by a striking and characteristic exaggeration of the lumbar lordosis.

Neoplasms involving the spine or other structures of the lower back are not infrequent. The pain is usually severe, unrelieved by rest, and frequently produces severe radicular radiations.

The postural backache is characterized usually by a pronounced variation in the normal anterior and posterior curves of the spine. The patient stands with a protuberant abdomen and a flattened chest, the so-called "question mark posture." The abdominal muscles are lax, and in obese individuals

the pull of the intestinal viscera upon the mesentery which in turn attaches to the lumbar spine causes a pronounced exaggeration of the lumbar lordosis. The postural pain as a rule is relieved rapidly by rest, and is essentially a fatigue syndrome of muscles attempting to carry on under unphysiological conditions.

Finally, we must consider a class of conditions extremely obscure in nature, but rather frequent in incidence. Profound changes in osseous structure take place consecutive to metabolic aberrations. Such aberrations are sometimes perhaps due to involutional changes of the aging organism, as may be seen in the osteomalaciac changes in the vertebral bodies of the aged that display pronounced decalcification and a type of compression which makes them appear like the vertebral bodies of a fish, i.e., bi-concave in contour. Similarly, we encounter metabolic vertebral changes productive of pain in conditions in which there has been a disturbance of calcium phosphorus metabolism, sometimes but not always attributable to parathyroid dysfunction. Changes from Paget's disease and many other bizarre pranks of disturbed metabolism may be encountered.

Treatment

The treatment of low back pain is the aspect in which the patient is interested. In general, we may say that the indications in a large number of the conditions noted above are rest in physiologically proper position, support of the skeletal and muscular structures, therapeutic and physical therapeutic management and graded exercises for functional reeducation.

Rest is often appreciated as a prime indication, but is not always effectively carried out. The fact that the patient has been placed in bed by no means provides rest for an affected lower back. In the dorsal decubitus, the back sinks into the soft mattress and therefore assumes a kyphotic posture. This posture in turn predisposes more than any other to the production of radicular irritation. In the soft mattress the spine is actually bridged between the shoulders and the pelvis, and consequently the protective spasm of the spinal mass of muscles is never effectively relaxed, and unless we can produce a situation in which relaxation can take place, we are most certainly going to weaken any other therapeutic measure we may undertake. Therefore, in the severely painful back in the average case we must attempt to place the spine at rest with the normal lumbar curve established and the back effectively supported.

In the less stubborn cases, rest upon a firm mattress which has no appreciable sag is adequate, but in more stubborn cases we must resort to some type of apparatus in order to secure the desideratum of rest and support. Particularly in the arthritic type of backache, is the use of the convex Bradford frame peculiarly effective, although it is a difficult thing to accustom the patient to recumbency upon the appliance. It is essential that the frame should not be wide, and the canvas stretched taut between the gas-pipe bars. In using this frame, especially in cases with pains radiating down the lower extremities, it is well to apply mild traction to the lower extremities and counter-traction to the head and cervical spine. During the period of adaption to the frame, a liberal use of sedatives may be essential.

An advantage of the appliance in addition to the effective support in the physiologic posture is the convenience with which a large number of physical therapeutic methods can be applied, while the patient lies undisturbed. Diathermy electrodes can be inserted between the patient and the canvas without disturbing the posture of the spine. General heliotherapy can be administered, and it is even possible to give effective massage. The disadvantage

of the frame lies in its expense, in the necessity of having a skilled bracemaker, and above all in the difficulty of securing the consent of the patient to this type of immobilization.

The moulded plaster-of-Paris shell is a useful alternative to the Bradford frame. This is a plaster-of-Paris model carefully prepared over the patient's back, while he is lying in the prone posture with the spine adequately lordosed. The shell is modeled directly over the skin of the patient, and when dry is covered with a very thin layer of felt. In this shell the patient rests, and on account of the accuracy with which it contours the body form, there is no feeling of undue hardness experienced by the patient. The back is well splinted, and the anterior body surface is unencumbered by any constricting dressing. The patient may be turned over on the shell for treatments to be applied to the back. The plaster-of-Paris shell is of greatest use in the treatment of fractures of the spine and more particularly in Pott's disease.

The plaster-of-Paris corset or corset spica has much to recommend it. In such a dressing approximate immobilization can be secured, and the patient, if the plaster is evenly applied without wrinkles, is for the most part reasonably comfortable and easily handled. It must be appreciated, however, that the plaster must be applied with an eye directed towards the other indications apart from rest and immobilization. The basic problem in any case is to treat the underlying condition and not the symptom. Protracted immobilization without subsequent treatment frequently predisposes towards a chronic insufficiency of the vertebral muscles, due to the atrophy ensuing upon immobilization. It is possible to apply a plaster-of-Paris dressing and to window it in such a manner as to permit the application of electrodes, and of course it is also possible to treat directly through the plaster by short wave diathermy. However, some direct stimulation of the spinal musculature is desirable as soon as the acute pain has subsided. For this reason, the removable plaster-of-Paris corset is to be highly recommended. This is made by moulding a plaster-of-Paris spica or corset using padding only over the bony prominences of the spinous processes and of the spines of the ilia. When the plaster has hardened, it is removed by making a single median cut down the entire cast and removing the cast carefully without distorsion or infraction of the plaster. In making the median incision it is well to remove a section of an inch and a half to two inches of the plaster. The cast is then sent to the bracemaker who applies eyelets or lacing hooks along the cut margins. The cast can then be re-applied and laced. The removal of the segment of plaster enables the patient to lace the cast to a comfortable degree of tightness. Such a removable cast fits accurately, is comfortable, permits the application of physical therapeutic modalities, massage and last but not least, it permits cleanliness as it can readily be taken off and re-applied by the patient.

After the subsidence of acute symptoms in these cases, it is a great mistake to discontinue immobilization and support too early, and yet from both the therapeutic and economic point of view, it is desirable to permit a resumption of activity at a reasonably early time. Totally inactive muscles and osseous structures become atrophic very quickly; on the other hand to permit the patient unsupported activity tends to elicit acute or chronic exacerbations of the painful manifestations. The open plaster-of-Paris corset or the more expensive and lighter celluloid corset is apt to be hot and inconvenient. Some form of low back brace is indicated in order to provide comfortable and cool support. Such a brace to be effective must descend low enough to achieve a firm grip upon the pelvic basin and must rise high enough to secure some basis of support upon the more immobile lower dorsal spine. The brace must fit well into the lumbar lordosis and must be held in

position by an abdominal apron which is so designed as to support the intestinal contents. The apron is not the least important feature, for if it is so contoured as to permit protrusion below its lower margins, the pressure exerted tends to increase rather than to relieve abdominal ptosis, and thus accentuates the tug of the visceral weight upon the mesentery, which as pointed out above, by its attachment to the lumbar area may produce postural stresses and thus cause continuation of the pain.

There are many forms of lower back braces, and the physician must of course vary the type according to the specific indications in each case. Goldthwaite's brace is perhaps the lightest and one of the most effective of all of these appliances. It is inadequate, however, in conditions in which it is essential to secure hyperextension, such as is necessary in the treatment of compression of the vertebral bodies. In these cases it is necessary to secure hyperextension by a Knight or Taylor type brace, to which at times cow horns must be added in order to keep the shoulders thrown backwards, and thus enforce complete hyperextension.

It is possible in mild cases to secure sufficient support by means of a well-boned fabric corset. This type of garment is most effective in the postural type of lower backache, inasmuch as it supports the abdominal contents, and also provides some slight assistance to the spinal musculature.

Adhesive strapping as a form of support is at times desirable, but purely as a temporary measure to be employed with considerable circumspection. The skin of so many patients is sensitive to adhesive plaster, particularly during the warm summer months, and the dermatitis induced is often so distressing that we must keep the patient under constant observation and remove the dressing at the first sign of irritation. The type of adhesive strapping so often applied, in which the plaster is put on in strips to the back only, is entirely illogical. It has no supportive influence whatever, and merely adheres to the skin, as does a label to a sack of flour. In order to secure support, the straps must either be firmly applied far anteriorly until they gain a hold upon the more unyielding integument over the anterior iliac spines, or preferably the strapping should be completely encircling, so that it exerts a supporting effect upon the abdomen, and a girdle compression effect upon the pelvis. Under such a strapping it is possible to apply a light splint shaped over the lumbar spine, thus affording every rational requirement for support. This dressing precludes the application of any effective type of physical treatment and should be discontinued as early as possible.

In the low back cases accompanied by pain sharply localized to the sacroiliac region with radiating phenomena extending down the sciatic distribution, I have found a method which I would term "direct medication" gratifyingly effective in many instances. The type of case in which I recommend this method is one with indication of arthritic irritation localized to one side in the sacroiliac articular area. The sciatic pain frequently predominates, but there is always a zone of pressure tenderness over the involved articulation. X-ray films will show merely a slight haziness over the sacroiliac articulation. In cases showing a destructive process, the method is most definitely contraindicated. Using a needle between $3\frac{1}{2}$ and 4 inches in length and of a gauge not exceeding No. 20, the sacroiliac groove is palpated between the posterior superior and posterior inferior iliac spines. The needle is then inserted obliquely aiming for the anterior superior iliac spine on the same side. With practice it is possible quite readily to insinuate the needle between the ilium and the sacrum to a depth of 3 to $3\frac{1}{2}$ inches. This brings the needle through the posterior sacroiliac ligaments into the true peri-articular sacroiliac zone.

Whether the point of the needle actually enters the small synovial area

of the point is debatable, but from the results of the injection it would seem that this is not essential. When the needle has penetrated between the two bones as described, between 0.2 and 0.4 cc. of a 2 per cent alcoholic iodine solution is injected. It is imperative that this solution should be fresh and should be filtered before use, as the presence of a precipitate probably of crystallized iodine produces unfavorable results. When the injection is made, the patient experiences a pain which radiates rapidly down the sciatic distribution, sometimes to the tips of the toes. The pain is dull and aching in character, moderately severe but subsides rapidly. It may be succeeded by a dull ache for a period of twenty-four hours, but this ache is rarely severe.

The rationale of this injection theory is the principle which is frequently used by the dermatologist when he applies irritative substances to chronic lesions. The introduction of a small amount of aseptic irritant stimulates in its wake a mild inflammatory response on the part of the organism which response is localized to the pathologic area. We have thus superimposed an aseptic irritation which mobilizes reparative mechanisms effecting beneficially the chronic process. The injections may be repeated at four day intervals, and rarely is it necessary to give more than four injections. Quite often a single one is sufficient to cause complete cessation of the pain. I have used this method over the past seven or eight years in many hundreds of cases with no untoward result and with a gratifying proportion of success.

Particularly in the traumatic lower back case consecutive to lifting trauma with sacroiliac sciatic phenomena, manipulation under anaesthesia effects the most rapid and satisfactory results. The manipulations are perhaps largely empirical, and cannot entirely be rationally explained. The contractures of the hamstring muscles are thoroughly overcome, and the lumbar lordosis is reestablished. Following this a plaster-of-Paris corset or corset spica is applied. In those cases presenting the crossed asymmetry of the pelvis described above, I employ a method by which the symmetry is restored. By forcibly abducting the femur upon the affected side over a fulcrum applied beneath the sacrum and with counter-pressure over the opposite ilium, followed by a sudden extension of the abducted thigh, it is possible to secure a distinctly palpable and sometimes audible phenomenon taking place in the sacroiliac region. After this manipulation it will be found that symmetry of the crossed measurements has again been established.

Operative measures are at times imperative in the low back cases, particularly in destructive lesions which progress in spite of conservative treatment. In certain cases of crushing injuries to the vertebral bodies or intervertebral discs, we resort to fusion of the spine. In those cases in which the pain emanates form intraspinal tumors or from herniations of an intervertebral disc into the spinal canal operative intervention is the only means of achieving relief.

My experience with caudal block has not been encouraging. Occasionally a striking result is secured, but for the most part the relief has been transitory, and I feel that the definite risks of the method are such as to warrant its use only after having exhausted all other rational procedures.

Of course it is obvious that in the arthritic type of case the usual antiarthritic régime must be carried out. Focal infection, metabolic disturbances and dietary factors must all be accorded proper consideration.

We must constantly be on our guard in the persistent low back case, lest we overlook a possible neoplasm. X-ray examination is fraught with many pitfalls. The neoplasm may become visible only after repeated roentgenographic examinations made at different angles. The tumor may be extraosseous, in which case we must depend upon the completeness of the physical

examination for the detection of the underlying neoplastic process. In cases in which immobilization causes a severe increase in pain, we must be particularly careful to attempt to exclude the presence of an osseous neoplastic process.

In this discussion I have refrained from entering upon more than passing reference to physical therapeutic methods, as that would be like carrying coals to Newcastle. I feel that all methods of treatment should be carried out as much as possible in a manner to permit the coincidental use of orthopedic and physical therapeutic measures, so that functional restoration may be effected with the utmost expedition. In this manner we can achieve results of maximum effectiveness and permanence.

Discussions of Drs. Troedsson's and Galland's Papers

Dr. H. Hallock (New York): I wish to emphasize what I think is the most important concept in Dr. Troedsson's presentation — an instability of the lumbosacral joint. This is his whole theme followed by a method of manipulation by which [so-called] slips which are an evidence of instability have been replaced and relief symptoms obtained.

At the New York Orthopedic Hospital, we believe that anatomic variations which are frequently found at the lumbosacral articulation determine to a large extent the mechanical soundness of this joint and its resultant stability. This area is the junction of a mobile and a relatively immobile part; and in the erect posture, the superior or weight-bearing surface of the sacrum is set at quite an angle to the horizontal. Tremendous stresses and shearing forces are thereby brought to bear even normally upon this joint; and these must be effectively met by the muscle and ligamentous structures. When anatomic anomalies are present, the articulation is rendered mechanically imperfect and stresses and strains are not readily and effectively equalized. The muscles and the ligaments, constantly called upon to do extra work, may fail; and symptoms of strain and injury ensue. The fifth lumbar with continued failure of the ligaments may become hypermobile and slips or subluxations may take place.

Manipulations may replace displacements or break down adhesions, and exercises will build up weakened muscle systems so that compensation may be regained; and all of this may and frequently does relieve the individual of his pain and get him on his feet again. But if he still has any great mechanical imperfection, such as a hypermobile fifth lumbar, an exaggerated lumbosacral angle, asymmetrical or poorly developed facets, an incomplete sacralization or a spondylolisthesis, he is left with a lumbosacral weakness, a fundamentally unsound articulation which like the sword of Damocles is ever ready to precipitate trouble and actually does time after time. So in this type of case, exercises and manipulations do not go far enough and they fail to effect a permanent cure.

Such cases, however, can be cured, the mechanical imperfections rendered ineffective and fifth lumbar stability achieved for all time, by fusing the lumbosacral joint. This is a safe operation; and it is what we have been advising and doing at the New York Orthopedic Hospital since 1914 in all inveterate cases whose symptoms and defects have been severe enough to warrant surgery. Our end-results of 73 per cent cure and 21 per cent improvement in the 150 such operations performed from 1914 to 1927, have justified this conception and practice.

Dr. Galland's presentation has covered the whole field of low back therapy. I like the way in which he stressed rest, and rest in the physiologically proper position. I do not believe that this can be overemphasized. All too often, this principle is overlooked. One of the most effective means of preventing a chronic disability is to properly treat the initial or acute injury.

He also spoke of the danger of discontinuing immobilization and support too early after subsidence of the acute symptoms. This, too, is very important, for otherwise a satisfactorily repairing lesion may be thrown into a chronic phase that will take months to heal or that may never completely resolve. It is the muscles and the ligaments that move and support the articulation; and when these have been strained or injured, it is most essential that their return to normal be not hampered in any way by careless or injudicious treatment. And if in addition there is present any structural imperfection of the joint itself, it is doubly important that complete healing of the injured supporting structures be obtained.

Dr. H. M. Herring (New York): Dr. Troedsson's clear and concise paper presents an excellent description of one of the common cases of low back derangement in the lumbosacral region. His narration of how it is frequently produced makes us see how the use of manipulation would be indicated for its correction.

Dr. Troedsson does not say in his paper whether he used some form of thermotherapy as a preparative measure or not. I prefer to use either the application of radiant light and heat for 20 minutes or of antero-posterior diathermy for the same time, to relax the softer tissues before at-

tempting any manipulative procedures. We also use in addition to these measures massage, support, and exercise to restore and maintain muscular balance in this area, after correction has been made.

Dr. Galland's excellent paper on the treatment of low back pain points out the essentials in therapy for this frequent complaint and lays down the rules to follow for satisfactory relief. The importance of bed rest in the early stages and of support for joint, ligamentous and muscular structures, in the later ambulatory stage, is of prime importance. To offset the deleterious effects of continuous prolonged rest, however, various physical therapeutic procedures are also indicated. Those should be chosen which act upon the circulation, and secure maintenance of tone in the resting part; namely, some form of heat, massage and exercise.

The use of manipulation to secure equalization of the sacroiliac stresses is an indication of the fact that we are really coming to recognize or admit that this joint has some movement. Note the similarity of mechanical principles in Dr. Troedsson's and in Dr. Galland's manipulative procedure. One is more rapid in execution but much the same in action on the sacroiliac and lumbosacral joints.

The injection of joints to produce a fibrotic reaction and a limitation of joint irritability is somewhat new. Its end results will be awaited with interest.

The misuse of adhesive plaster strapping reminds us that ineffective immobilization is of little or no value. Also that after manipulative correction a somewhat flexible support of this kind is a prophylactic against recurrence.

Postural strain is the most common cause of the vague backache in which it is difficult to find the lesion. Here one must start at the feet and correct any faults in the foundation before blaming the superstructure.

Dr. R. E. Brenneman (Meadville, Pa.): In the limited time at my disposal for the discussion of Dr. Troedsson's contribution on low back pain, and his unique method of reducing these displacements by manipulation, I wish to endorse his thesis and, as a pupil of Goldthwaite, to subscribe to his ideas. I have read his paper with great interest, and wish to restate an old personal maxim — "This should be taught in our medical schools." If it were, many patients would be kept from the irregulars. More papers of this type should be presented.

I believe that most of these low back pains, as well as pains in the spine anywhere, not due to acute disease or sprain, are due to misplacements of one kind or another. The failure to realize the truth of what I have just said, accounts for the vast horde of irregular practitioners, who, without restraint of medical ethics, loudly proclaim their successes and conceal their failures in reducing the so-called "lesions." The public is thereby impressed and rushes to them for relief.

And if one has seen, as I have, dislocated iliac and lumbosacral joints put up in plaster casts, without reduction, in reputable clinics by ethical men, and allowed to remain in the casts from six to eight weeks, with suffering sufficient to require morphin, and to emerge from the casts with many boils and no relief, one can understand why the public goes to these quacks; for they, in all their ignorance, do not resort to such painful and usually futile methods.

Dr. Troedsson mentions briefly the important role of the x-rays in the diagnosis of these low back lesions. As a radiologist, I wish to elaborate his point. Until recently the x-ray films of sacroiliac disorders have been almost a total loss except in severe traumatic cases. This is due largely to the nature of the joint and to the position of the patient, while being filmed. Usually only a horizontal anteroposterior and a lateral are made. And the films in these positions are useless — unless the lesion is a gross one and due to an injury. In the so-called sacroiliac slip, the position of the iliae becomes normal with the patient recumbent. In discussing this with Chamberlain, now of Philadelphia, he suggested a technic which I have followed for the past ten months.

After making the usual horizontal films, the table is tilted to the vertical position. The patient stands on a box several inches high, facing the table, and bears his entire weight on one foot, the other leg hanging over the edge of the box. A film is made, and carefully marked. The hips are supported by the usual table belt. A second film is made of the other hip, using the same technic.

In interpreting the films, an allowance of two millimeters in the level of the symphysis is made for the normal mobility. If there is a greater variation than this, it is obvious that a pathologic mobility is present. Either one ilium is upward and backward, or the other downward and forward. A clinical examination of the sacrum will determine which side is at fault. The presence of congenital conditions and acute infections must be eliminated. If the dislocation is persistent and accompanied with considerable pain, and the level at the symphysis uneven in the horizontal film, then a manipulative reduction is necessary, followed by rest, physical therapy, and a proper support to wear for a considerable period after getting out of bed. If the malposition is apparent only in the vertical films, and the pain is vague, mild therapeutic measures and a proper belt, will in all probability be sufficient for a cure. The cases that have followed this plan, out of my series of twenty-two since last November, have done very well. The Ghormley-Kirklin technic, described in the February, 1934, issue of the *American Journal of Roentgenology and Radium Therapy* is of great assistance in diagnosing faults in the lumbosacral articulations. Chamberlain also refers to the lateral horizontal position to show these lesions.

Since reading Dr. Troedsson's paper a few weeks ago, I have used this method in

three mild low back cases and found it very satisfactory. My method in reducing a severe and apparently fixed malposition of either ilium is to place the patient prone on a firm table, have him strapped there or held by assistants. An anaesthetic is optional. Narcotics may suffice. Place a small sand bag under the normal symphysis, have an assistant grasp the leg on the affected side and make traction, usually outward and upward, at the direction of the operator, who uses his weight with one hand on the affected ilium and supports the normal symphysis with the other. Sometimes the reduction is accompanied by a peculiar noise — at other times by a slight giving way under the pressing thenar eminence.

A check is always made with a film. If a reduction has been accomplished — either adhesive plaster, or a belt is applied, and the patient put to bed. Appropriate therapy is used subsequently, and usually a rapid recovery takes place. In the milder cases, rest in bed is unnecessary. (The belt is 2½ inches wide, made of canvas, lined with chamois skin. Lugs are attached to hold small caliber rubber tubing, which passes between the thighs.)

There are many methods of manipulating the pelvic joints — both for diagnosis and for treatment. In fact nearly every operator has his own method for both. In reading the literature, one can scarcely escape this conclusion. Two names stand out, however, Goldthwaite and Sir Robert Jones.

Unique among the methods of reducing these subluxated backs is one described to me by a colleague. He had a bad case of lame back which he had unsuccessfully treated for some months. One day his patient started for the cellar. On the second step down she tripped and bumped to the concrete floor. When she got up and took stock of her bones, she found, to her great satisfaction, that her backache was gone. Another patient who had suffered for many months from a low back pain with an accompanying sciatica was bending over a chair one day when she felt a sudden "giving way" in her sacrum. Upon straightening up, her pain was gone and it has not returned. My experience has convinced me that these malpositions are actual entities, which *may* be reduced by accident, as I have shown, and are always susceptible of reduction by a competent operator.

Dr. Henry Cogan (New York): Dr. Troedsson's paper limits me to discussion of "low back pain" as produced by subluxation of the inferior articular processes of the 5th lumbar vertebra. X-ray studies in a 45 degree angle, oblique view, when properly taken reveal a clear outline of the articulating processes and their facets. It is a rare occurrence to detect a subluxated articulating process unless there is a fracture of the vertebral body with separation of fragments. Two types of supposed subluxation of inferior articulating facets of the 5th lumbar vertebra are recognized. One, where on the painful side with pain referred down one thigh posteriorly there is apparent shortening of the leg, measured from anterior superior spine to internal malleolus. This type responds quickly to simple manipulation. This is the type which Dr. Troedsson was successful in reducing by the simple method he described in his paper. Realizing that the subluxation is probably accompanied by "stretching of joint capsules and ligaments and probably effusion and swelling around joints," Dr. Troedsson suggested following the reduction by rest, baking, and massage. Some authorities believe, that there may be more than stretching. There are probably ligamentous and muscle tears. There is muscle spasm of the erector spinae muscle and with few exceptions the patient will localize the pain at the insertion of the long erector spinae muscle on the one side.

It seems to me, that it would be more logical first, to do some baking to relax the spasm of the erector spinae muscle and then reduce the subluxation by the kicking and traction.

The second type, the type, in which there is an apparent lengthening of the leg on the side of subluxation. Manipulation in this type is not always met with rapid success.

When there is a list of the trunk to the opposite side from the leg to which the pain is referred, rapid relief is obtained and the patient may remain comfortable without further treatments after 3 to 7 days. When the list of the trunk is to the same side proper treatments will yield relief for brief periods but will necessitate further office visits for a number of weeks.

The doctor's explanation of causes of subluxation is interesting. I accept the explanation and I am glad that he presents it here in New York and not in Tennessee. (John Thomas Scopes.) Think what would have happened to him over there?

Dr. Galland's paper is very interesting, but can be better discussed by an orthopedic surgeon. The fact that Dr. Galland suggests "coincidental" use of orthopedic and physiotherapeutic measures indicates that diathermy, infra-red, and static electricity are becoming more and more recognized by the medical profession as a valuable addition to our armamentarium.

FEVER THERAPY *

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The concept of fever therapy may be traced to the dawn of written history. "Give me the power to produce fever, and I will cure all disease," is an aphorism attributed to Hippocrates. Ruphos of Ephesus, four hundred and fifty years later, said: "If physicians were able to produce fever, no other method of treatment would be necessary."

The practical application of fever for therapeutic purposes, however, had to wait centuries for advances in the medical and allied sciences for modern technics to raise body temperatures. The history of fever therapy may be divided into an empiric and a scientific era. The link between these two eras was medical thermometry which was initiated in the early part of the seventeenth century by Galileo and Sanctorius, and was crystallized in the second half of the nineteenth century by Wunderlich and Allbutt.

A survey of medical practices of primitive peoples also furnishes some data on the early concepts of fever therapy. The American Indians as well as the primitive inhabitants of northern Africa physically produced fevers for the treatment of disease.

William Penn in a letter to Dr. Edward Bayard, a fellow of the Royal College of Physicians, described how an Indian Chief obtained almost immediate relief from an illness after the use of a hot vapor bath.[1] The sweat bath was a favorite therapeutic measure among the early Americans. Arthritis, neuritis, and rheumatism were common among them. These painful illnesses were not distinguished from each other, but were all treated with the sweat bath. Carolina Indians used hot mud holes for treating various diseases of the extremities. In remittent and other forms of fever common among the inhabitants of the Bight, Northern Africa, sweating was induced by hot sand and hot water baths.

The Chinese, and the Japanese who derived their medical practice from China, were among the earliest peoples to use their intensely hot springs solely for therapeutic purposes.

In Japan the volcanic formations gave rise to many hot springs. These thermal springs became known for their curative effects upon syphilis, arthritis, rheumatism, acute genito-urinary infections, and respiratory, nervous, digestive, and ocular diseases. They have been very popular throughout the Japanese empire since the sixteenth century, and had enjoyed local renown for several centuries before that time. Indeed, the use of the thousands of hot springs in Japan was common among all classes of the populace as one of the most important sources of cure long before the introduction of European medicine, and this at a time when the Chinese medicine man still ruled the country.

At Kusatsu water still gushes out of the bases of ancient volcanoes at a temperature between 100 and 160 degrees F. As the water flows into reservoirs, it is unbearably hot. The bathers stir it with large wooden paddles to cool it slightly. Then they immerse themselves to the neck and pour hot water over their heads with wooden dippers. After three to six minutes of this refined torture they bob out almost parboiled with a body temperature between 103 and 105 degrees F. This fever continues for some time after leaving the bath. Since these hardy people take two to five baths a day, it is clear that quite a decided and persistent elevation of temperature results. The procedure often leads to

* Read at the Western Section of the American Congress of Physical Therapy, Los Angeles, June 18, 1936.

a diffuse dermatitis of the skin with extensive formation of blisters. It is one of the most vigorous non-specific means of fever production.

From the dawn of medicine through ancient and medieval periods, up to the seventeenth century, physicians used heat as a therapeutic measure. Medical practitioners applied heat without realization of its physiologic effects, and theorized about fever without any scientific inquiry into its significance. Artificial fever produced by physical means obviously was not entirely a modern concept. But until recently it depended upon vague, philosophic beliefs and empiric observations.

Modern medical practice assumed a scientific character with the development of the technics for research during the seventeenth, eighteenth, and nineteenth centuries. The exact nature of fever could not be understood until heat could be measured according to the laws of thermodynamics. Perfection of the thermometer, invented about 1600, required three centuries, but it was not until the second half of the nineteenth century that the modern theories of thermodynamics were formulated. Present day fever therapy, so dependent upon progress in physiology and in electrical engineering, is in some measure an outgrowth of these developments.

Interest in temperature determinations was stimulated by Fahrenheit, who in 1714 described the use of mercury in thermometers.

Up to the time of Clasius (1850), heat was generally regarded as a material substance. Clarification of the fever problem had been impossible on such a concept. Only after Kelvin in 1849 established his absolute scale of temperature, and Clasius and Helmholtz in 1850 elaborated the mathematical laws governing heat transformation, was the scientific framework for clinical thermometry laid.

In 1883, Philips[2] conceived the idea of producing a sustained rise in temperature for therapeutic purposes by hot baths. He demonstrated by self-experimentation that his temperature could be raised to 103 degrees F. by prolonged immersion in hot water. His contribution unfortunately was ignored with the passing of time. It had to be rediscovered several times before its importance was appreciated. Philips' findings have since then been confirmed and elaborated upon by other investigators.

Recent research in fever and fever therapy, was in a large measure the result of work by v. Jauregg, and by Whitney. After twenty years of observation v. Jauregg confirmed the numerous indices of the past and, in 1917, undertook inoculation of paretic patients with malaria, on the theory of the favorable effect of febrile diseases upon psychoses. It should be pointed out that the beneficial effect of malaria in epilepsy had been known even to Hippocrates. According to Maisani[3] its curative effects in paresis and in insanity had been recorded in more than 160 cases before v. Jauregg's monumental work. Yet v. Jauregg established the clinical value of this procedure and popularized it so that it received international study.

Subsequently a host of less noxious proteins than the living malaria plasmodium were studied for similar purposes. In this connection physical agents such as the hot bath, diathermy, and photothermy also were utilized. The discovery of Whitney, an electrical engineer, finally revealed the extensive possibilities of fever therapy induced by physical methods.

In January, 1928, Whitney had developed a high-powered short wave tube for long range radio transmission. When this tube was placed on test, the men working with it complained of headaches and other discomforts. A physician examining these men before and after work found that a half hour's exposure to radiations from the tube produced two or three degrees of temperature elevation.

Whitney had known of v. Jauregg's work and of the search by the medical profession for a harmless, effective method of producing controllable rises

in temperature. He felt that high frequency oscillations produced by the new short wave tubes offered a means of creating artificial fever with greater control than was hitherto possible. After experimentation on small animals he demonstrated that this method could be used with safety. A number of larger sets were then loaned to a group of physicians and research institutions for further study on clinical material. Thus within the last few years a mass of correlated clinical and experimental data has been collected from these investigators.

In addition to these short wave currents, there are other physical methods which may be employed for the elevation of systemic temperature. If speed of this rise be our objective, possibly the most effective technic is the use of the hot water bath. We have found the most convenient bath technic to be the immersion of the patient in water of about 100 to 102 degrees F., followed by a gradual elevation of the temperature of the water to about 106-107 degrees F. After thirty-five minutes, the rectal temperature of the patient has usually risen to 105-106 degrees F. Frequently this method is too rapid, so that the patients show evidence of tetany.

While the hot water bath is a good method for the *elevation* of systemic temperature, it is not very suitable for its *maintenance*. We therefore transfer the patient to a bed and surround him with blankets. If necessary, a hot water bottle is also used, or a horizontal electric light cabinet is placed over him. With proper technic, it is possible to use diathermy or the short wave current previously mentioned. In general, we have found the use of the horizontal light cabinet to be best suited for the maintenance of elevated temperature. This device permits the ready use of diathermy or short wave currents as additional heating agents applied to the pelvis in the treatment of gonorrhea.

To overcome the uncomfortable sensations of the patients while undergoing treatment, sedatives like small doses of hyoscine and of morphine, are indicated.

Physiologic Responses

The use of controlled temperature elevation has permitted us to study physiologic responses to fever.[4] The findings shed some light on the significance of temperature elevation when it occurs as spontaneous fever in response to some harmful invader. The adjustment to high temperatures is regulated by heavy secretion of sweat. This loss of fluid may equal almost the entire blood volume. The skin surface temperature rises at once. The gradient that ordinarily exists is eliminated. Thus the various areas of the cutaneous surface reach an almost common temperature level, lower than the systemic temperature, however, even when the environmental temperature is much higher.

In fever produced by biologic agents, such as proteins or vaccines, the surface temperature of the extremities does not rise until after the systemic temperature has become markedly elevated. Subsequently the skin temperature rises and its gradient disappears.

Artificial fever therapy seriously interferes with heat regulation. High temperatures may approach the danger limits. It is therefore imperative to make constant observations of the systemic temperature. A sufficiently accurate guide for this purpose is the recording of rectal temperature by an automatic registering thermometer. However, in treating gonorrhea by a special technic of differentially increased heating of the pelvic tissues, we have to rely upon mouth temperatures, which average about 0.7 degree F. lower than rectal readings.

The velocity of the blood shows a marked increase. On one occasion, we observed an increase of more than 400 per cent. This acceleration might be due to many other changes in the circulation, such as in the pulse rate, the blood pressure, and the volume and viscosity of the blood. In artificial, as in

spontaneous fever, the pulse rate is faster. In 500 observations, we noted an increase of about 8.5 beats per minute for each degree Fahrenheit of elevation.

The systolic blood pressure shows a slight rise, followed by a gradual fall to a point below the original level. The degree of this decrease, the speed of its production, and the intensity of the symptoms it causes, appear to bear a close relationship to the original tension. In many instances we heard the pulsations when employing the ordinary ausculatatory technic while the mercury in the manometer went all the way down to the zero mark.

Although the patients lose large quantities of fluid through sweat (as much as 3-4 liters), the loss of weight at the end of the treatment is insignificant, provided they are permitted to drink as much fluid as they desire. The blood volume usually remains unchanged, as does the viscosity.

There is an increase in the respiratory rate. Apneic periods appear with gradually increasing frequency. The changes in the character of respiratory movements are reflected in the altered status of the oxygen and carbon dioxide content of the blood and its increased pH.

Few of the changes following artificial fever therapy have received as much attention as the leucocytic reaction. We noted an initial reduction of about 25 to 30 per cent in the number of white blood cells in the first two hours of a hyperpyrexia treatment. This is followed by a hyperleucocytosis between the sixth and ninth hours of treatment. The maximum may amount to 86 per cent above the initial figure. The variations are due mainly to the change in the total number of neutrophils, of which the staff neutrophhils show the greatest increase. Repeated stimulation by heat, however, causes a reduction in the leucocyte response.

The sedimentation rate of the erythrocytes shows a fall as a result of temperature elevation.

The reaction, the osmotic pressure, and the volume relationships of the body fluid are closely dependent on properly regulated acid-base equilibrium. The changes take place within a short time, so that it is possible to study the factors regulating the acid-base balance without the interfering effects of the intake of food and the loss of catabolites in the feces. Our patients suffered from a variety of pathologic conditions, and we therefore feel justified in interpreting the results which remained consistent as independent of the specific pathologic condition.

Fever increases the quantity of lactic acid in the blood. As a result, the carbon dioxide content drops to about one-half of the normal value. The stimulating effect of free carbon dioxide on the respiratory center soon results in a "blowing off" of more carbon dioxide. The patient may manifest extreme alkalosis, with a blood pH approaching 7.6.

The extreme loss of chloride resulting from heavy sweating diminishes the chloride in the whole blood as well as in the urine. The gastric juice shows a similar loss of chloride with a practically total cessation of secretion of free hydrochloric acid.

At elevated temperatures, our patients show an increase in hemoglobin and in oxygen-combining capacity.

In addition to these changes which I have described, it is of therapeutic significance to point out the effect of heightened temperature on bacterial cells invading the human organism. The thermolethal effect on the gonococcus, for example, has been definitely established.[5] I shall enumerate figures presently showing our therapeutic results in treating gonorrhea. Besides eradicating the causative organism, we have observed as a result of fever therapy a reduction in the complement fixing titer in the serum of individuals suffering from the disease.

We studied electrocardiographic changes during and following a three to five hour period of physically induced fever at 104-106.5 degrees F. The alterations of

the electrocardiographic waves were not uniform. The mechanism of these changes probably acts through reflexes, tachycardia, local cardiac and general chemical and physiologic alterations. None of the electrocardiographic changes were permanent. We could not infer that physically induced temperature elevation produced any harmful effects upon the heart.[6]

Advantages and Clinical Results

Before describing the results obtained in my own patients, I mention briefly one consideration in connection with fever therapy. It has been demonstrated by many workers that fever induced by physical means is of value in any condition for which malarial, typhoid, or protein injection therapy is indicated. This newer method has the following advantages: (1) The reaction may be controlled, both as to height and duration of fever; (2) the desired reaction is assured in all cases, and is secured promptly; (3) when properly administered, this form of treatment has no permanent injurious after-effects.

We have administered 1684 treatments to 462 patients. These patients suffered from a great variety of diseases. Our most satisfactory results from fever therapy were those secured in the treatment of gonorrheal infections. We are particularly interested in the treatment of gonorrhea of the female, because heretofore it has been a difficult disease to control. We have had a total of 98 cases. Of these 5 were failures in that the organism still persisted after 1 to 3 treatments. We believe that we could have had better results in these instances if we had had the opportunity to treat them longer. Five other cases are lost to us in this series because of an inadequate follow-up method. The other 88 cases were rendered gonococcus-free and have remained so during a period varying from six months to five years. A rapid subsidence of pain in the presence of tubo-ovarian involvement was seen. Large masses within the pelvis gradually became absorbed and disappeared, leaving no evidence of their presence in most instances, and occasionally only some mild degree of thickening. We used combined systemic and additional local heating. In the last 21 cases of our series, the average number of treatments administered was 1.3 per patient. In the cases preceding this group, our technic consisted of a shorter period of both local and systemic temperature elevation. Our average number of treatments there was 2.2 per patient.

In our male patients, we found greater difficulty in applying additional local heating to the genital organs while systemic temperature was maintained at a high level. Our results, therefore, were not quite as good. We treated a total of 26 patients, of whom 17 were rendered gonococcus-free after one treatment. Four still showed the presence of the organism, and five were lost because of inadequate follow-up. During the course of treatment we have found that frequent examination of urethral smears is an aid in determining the length of time necessary for the maintenance of systemic temperature elevation. Smears are taken at first every two hours, and subsequently at intervals of one hour. When we no longer can detect the organism, we persist in the maintenance of temperature elevation for an additional hour. Gratifying results were also obtained in the treatment of *gonococcal arthritis* by fever therapy. In our 31 cases, 26 we achieved a complete restoration of function. Three were unimproved, 2 of these presented themselves with bony ankylosis requiring arthoplasty. In 2 we had no opportunity to follow up the results. After the initial treatment there is a rapid subsidence of the pain and acute tenderness in the involved joints. The cases required 3 to 5 treatments. Local physical therapeutic measures are subsequently employed to cause the disappearance of residual pathologic processes.

Of the *non-specific arthritides*, the acute infectious cases and those in the subacute stage respond well to fever therapy. Temperatures of 105-106 degrees F. are maintained for periods of 5 to 6 hours. In the chronic type, while immediate improvement occurs in nearly all, the subsidence of pain and in-

creased motion does not persist after a period of 24 to 48 hours in many instances. The percentage of permanent results is not high. Grouping the various forms of arthritis, we find that out of our 41 cases, 21 or about 50 per cent showed some, definite degree of permanent improvement. Nine cases remained definitely unimproved and the course of 11 could not be observed subsequently. In the degenerative form of arthritis, our results were poor.

We treated 35 cases of *central nervous system syphilis* (paresis, tabo-paresis and tabes). Excellent results were obtained in 18 of these cases. Seven did not show any great improvement and 10 did not give us the opportunity of following up the results obtained. In one case of *luetic optic atrophy* the rapid progress of the lesion was arrested. It is our opinion that the most effective treatment for syphilis in any stage available today is the combined use of chemotherapy and fever therapy.

Since *multiple sclerosis* is characterized by remissions, it is difficult to evaluate therapeutic results. In 24 patients treated with an average of 8 treatments at temperatures of 104-105 degrees F. rectally, maintained for 4-5 hours, 9 had no relief; 11 had moderate relief. Treatments were usually given every fourth day. In view of the fact that there is no known form of therapy which offers much relief for this condition, it is advisable to try physically induced fever to secure some alleviation. The earlier this therapeutic procedure is employed, the more likelihood is there of some reduction of symptoms.

Two cases of *polyneuritis*, 3 of *radiculitis*, and 1 of *myeloencephaloradiculitis* responded well with complete disappearance of symptoms. One case of *lead neuritis* showed very definite improvement under fever therapy.

Of 13 patients suffering from *encephalitis*, 4 showed some slight degree of improvement, 7 were unimproved and 2 were lost to our continued observation.

All but one of 8 patients suffering from *chorea* showed definite improvement. There was a gradual diminuation in the choreiform movements. Treatments were given twice weekly, the temperature being raised to about 105 degrees F. and maintained at that level for 4 to 5 hours. These children took the treatments well in spite of the presence of rheumatic endocarditis.

In four cases of *rheumatic* fever having multiple joint and active heart lesions, there was no change in the course of the disease following the application of artificial fever.

One individual with *subacute bacterial endocarditis* subjected to fever therapy developed emboli subsequent to the treatment and died.

Varying degrees of relief were obtained in 15 patients with intractable asthma, most of whom were definitely improved. Some had complete cessation of attacks for as long as nine months. The best results were produced by maintaining the temperature at 105 degrees F. for 5 hours, twice weekly in a series of 5 treatments.

Four patients afflicted with *carcinoma* were given fever treatments in conjunction with x-ray therapy. No decided change in the condition was noted, and all the patients died eventually.

In conjunction with dermatologists, we have treated a large number of varying *skin conditions*, including dermatitis exfoliativa, mycosis fungoides, pemphigus, psoriasis, and scleroderma. In these, some degree of temporary improvement was obtained. Long lasting improvement was noted in skin conditions with an allergic background, such as recurrent eczema, and a number of chronic dermatoses. It appears to be the opinion of the dermatologists that when simpler measures fail, physically induced elevation of systemic temperature is of definite value in the treatment of many chronic skin diseases.

Fever therapy is gradually coming into wider use for the treatment of the conditions mentioned and others such as, for example, diseases of the eye.

(*Concluded on page 49*)

NEW AID IN DIAGNOSING FOCAL INFECTIONS OF DENTAL ORIGIN

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In the routine x-ray examination of the mouth we frequently find teeth with greater or lesser pathologic involvement, which apparently are not causing the individual any manifest discomfort. Where the patient is not suffering from any general impairment in health, the removal of these teeth or the elimination of the infection by treatment calls for no comment other than to stress the value of such periodic examinations. But, if the individual is subject to some general disease often associated with a focus of infection (rheumatism, arthritis), the discovery of abscessed or infected teeth merits consideration. It should be remembered that even in these cases the involved teeth may or may not be the causative or even contributory factor.

Here a differential diagnosis is necessary. If the teeth are responsible either wholly or in part, it is important for the physician to be cognizant of the fact. If they are not responsible, then reliance for relief on extraction of these teeth or on specific treatment of the infected region is bound to bring disappointment, not only to the physician but also to the patient. In addition, this will create a loss of respect for the opinion of the dental profession because of the hope advanced that with the elimination of these dental foci will come relief from the general impairment.

The disrepute into which the theory of dental focal infection has fallen may be attributed to the uncritical thinking individuals in both of our professions who are still ascribing most of the baffling affections to diseased teeth. Too often hope has been erroneously aroused in a patient whose condition bore no connection with diseased teeth, that the extraction of these would afford a cure.

In working with ionic medication, over a period of years, in the treatment of dental disorders, I was struck with the number of times I was able correctly to prognosticate whether the treatment of dental conditions would or would not help a patient suffering from a general disability. By means of ionic treatment one can determine after the first visit, with a fair degree of certainty whether the condition present in the mouth is acting as a focus of infection.

Diagnostic Value of Ionization

Ionic medication is an electrolytic method of introducing active ions into the system. It is beyond the province of this paper to discuss the theory of this form of treatment or its technical application. I shall merely confine myself to pointing out its great value as an aid in diagnosis. It is sufficient to state that these ions actually penetrate into the tissues[1-2] and possess a distinct bactericidal effect.[3-4]

Sturridge[5] suggests that in the destruction of bacteria in dental tissues by ionization, antibodies are stimulated by the subsequent absorption of the dead microorganisms into the general circulation. It is further obvious that if these bacteria in their active state are responsible for the general systemic disturbance, the correct antibodies will always be provided.

In ionization, therefore, we probably possess a means of producing a specific autogenous vaccine, specific for the disease and for the individual suffering from the disease. We know of nothing that compares with such

specificity, and this in all probability accounts for the immediate results which make diagnosis possible.

When it is desired to determine whether a dental condition is acting as a focus of infection, an intense ionization is administered locally at the first treatment. This intense dosage, acting in a manner similar to a large dose of a prepared vaccine, produces an aggravation of the symptoms peculiar to the disease if the dental condition is in any way related to the systemic disturbance. If no reaction is had, it is fairly conclusive that the dental condition is unrelated. Ionization applied in this manner acts very similar to the Herxheimer reaction in syphilis.

The technic for this diagnostic treatment is simple. The negative electrode carrying a 2 per cent solution of Lugol is applied on the gums, over the apical area in the case of a dental abscess, or over the gingival margins in the case of a pyorrhea. The indifferent (positive) electrode saturated in a weak solution of magnesium sulphate is placed on the arm. The potentiometer of the machine is very gradually increased until the patient experiences an unpleasant sensation, then it is turned down slightly. This is the tolerance point. According to experience, the most effective result is obtained when the dosage is approximately divided into milliampere-minutes and each treatment time to thirty milliampere minutes. This is computed in the following manner: If the meter reads 3 milliamperes, treatment is maintained for about eleven minutes, this because I desire slightly more than 30 milliampere-minutes for the diagnostic reaction. It is important to renew the Lugol solution on the negative electrode before each seance.

Fig. 1

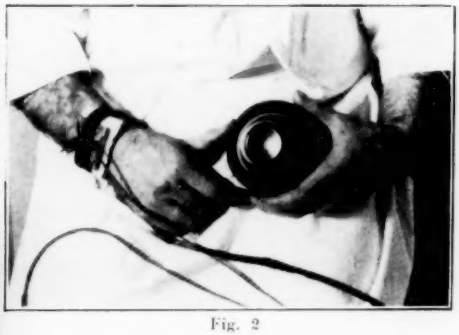

Fig. 2

Fig. 1. — Application of active electrode on mucous membrane over apex of suspected tooth. Indifferent electrode strapped to patient's right wrist. Patient holding controller by which he adjusts current intensity. Apparatus at right.

Fig. 2. — Another view of indifferent electrode on wrist of patient and controller in hands of patient.

The dosage for diagnostic purposes is distinctly different from that used in regular dental ionic medication. In the latter case we strive for an amelioration of the condition, while in the former we want to produce a distinct reaction. If we think of this form of treatment as perhaps creating a local autogenous vaccine, it is logical to expect symptomatic relief by starting with small doses, gradually increasing their size until the maximum of 30 milliampere-minutes is reached. On the other hand, if a large dose of this form of autogenous vaccine is administered, requiring more than 30 milliampere-minutes, as an initial treatment, it is to be expected that an exacerba-

tion of symptoms may be initiated which is gradually followed by relief. This is exactly the experience encountered in our practice.

Case Reports

Three cases are offered to illustrate our observations cited above:

Mr. G., age 38, a prominent attorney, referred by Dr. P., with symptoms of acute bursitis of the left shoulder. The distress was so pronounced that even though he carried his arm in a sling, the slightest movement caused paroxysms of pain to radiate down his arm. Routine x-ray examination disclosed a pyorrheic condition. Clinically, the gums showed inflammation with a free flow of pus. A diagnostic treatment was given at the first visit to determine whether there was any cause and effect relationship between the pyorrhea and the bursitis. The next day the patient reported that he had spent a very restless night with marked increase of pain. The day following he reported pronounced improvement. Treatment of the pyorrheic condition resulted in complete elimination of the bursitis.

Mr. S., age 52, a chauffeur, referred by Dr. T., suffering from pain in the small of the back and lumbago. Under medical care for the previous six months without any distinct improvement. Referred to me for diagnosis. X-ray and clinical examinations showed a condition of chronic pyorrhea. The question Dr. T. wished answered was whether these two conditions were related. A diagnostic treatment of 32 milliampere-minutes given. The physician called me that night and reported the patient in a much worse condition. Morphin was injected for relief. The extraction of a few teeth resulted in complete relief with no recurrence to date, two years after treatment.

Dr. S., ag 45, a Rhinologist from New York City. X-ray examination negative. Clinically very few teeth left, but those few in very good condition. He complained that he evidently had a fistula in the region of the upper right second molar area as he tasted a discharge from that area occasionally. I could find no trace of such an opening. He stated that his symptoms were of a tearing pressure pain at that site where he had had a second molar extracted twenty odd years ago; a marked debility reflecting on his mental and physical condition to such a degree as to force his retirement from practice, associated with headaches, rheumatic attacks, frequent profuse perspiration, metastatic inflammations in his joints and left ear. He had been ailing for the past six or seven years. The diagnosis after the first treatment was a chronic trabecullitis the result of a residual infection acting as a primary focus. Ionic treatments have resulted in the elimination of pain and in his restoration to normal health although it is too early at present to state definitely that a cure has resulted, as only four months have elapsed since the diagnostic treatment.

The above described records are similar to many other cases referred by physicians wishing to determine whether the teeth were responsible for some particular systemic disease. Many of the results are a repetition, more or less varied, of the three cases cited above. On the other hand I have treated a large number of individuals where ionization did not produce any general response. In these, no matter how bad the mouth condition was, dental treatment, while helping the teeth, did not afford the slightest amount of relief from the systemic illness. The few cases where in spite of the absence of reaction following ionic treatments, the patient obtained positive relief, recovered either because of the physician's treatment, or because of the patient's natural recuperative powers, but not because of the elimination of the dental disorder.

In this connection it is interesting to note that while dental abscesses in many cases act as foci of general infection, they in nowise are as frequently responsible for general disease as is pyorrhea, a fact frequently overlooked.

Conclusion

1. While the x-ray shows the amount of dental destruction, it does not determine any relationship between the diseased tooth and a general infection.

2. A positive reaction to a large dose of ionization does definitely establish such a relationship.

3. The absence of such a reaction excludes the suspected mouth condition as a primary cause even if the patient recovers following the elimination of the teeth.

4. Ionization is a valuable diagnostic adjunct of focal infection related to systemic disease.

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Special Report

INAUGURATION OF ELECTROPATHOLOGIC MUSEUM, UNIVERSITY OF VIENNA

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The splendid labors of Professor Stefan Jellinek, of Vienna, in the field of electropathology have been recently crowned by an event which is unique in the annals of medicine and represents a milestone in the advance of a disciple of great scientific and humanitarian importance. On October 29, 1936, the old and famous University of Vienna celebrated the inauguration of a Museum of Electropathology as part of the great teaching hospital, the Allgemeine Krankenhaus, for the realization of which Jellinek had devoted all his great energies throughout a great part of his professional and academic life.

The ceremonies, though as solemn as similar ones held in institutions of learning, differed in the presence of non-medical delegations, no doubt to symbolize the general value and applicability of electropathology to the industrial world. The gathering, presided over by the head of the state, President Wilhelm Miklas, was composed of such notables as the *rector magnificus* of the university, the dean of its medical faculty, military and ecclesiastic dignitaries, delegations of electrical engineers and of electrical workers. Foreign powers, including Japan, were represented by emissaries of learned bodies. The writer represented the Duchenne Society of England.

Many laudatory and scholarly addresses were presented, but perhaps the most impressive, because the most humble, was by a working man who spoke on behalf of the electricians in Vienna. These men had collected a thousand shillings which they presented to Professor Jellinek as a mark of their appreciation of the work he had done in behalf of their industry.

The museum is of a very original type, and shows the result of scientific research and the practical application to the questions of daily life—Pathology biology, technology, criminology, and sociology. There are models and drawings illustrative of the manner in which treatment should be administered to

the victim of a high tension discharge, or one suffering from any form of electric shock. How the hygienist should prevent such an accident, and how the expert witness can judge by the traces which the current has often left, whether it is a question of murder, suicide, incendiarism, or lightning, and the like. For the technologist and engineer, the problem of the construction and dangers of the ordinary electrical lamp, the value of the electrical conductivity of various materials, notably concrete, especially from the point of view of the modern concrete buildings is set forth.

Sixteen rooms comprise the museum, which constitutes part of the University, and is more or less under its supervision. The collection of electropathologic models is divided into different categories. A large section is devoted to industrial accidents and their treatment. The value of lumbar puncture is emphasized by a model showing the needle *in situ*. Many other specimens illustrate Professor Jellinek's theory of the mechanical action of electricity. There are also reproductions showing how the hair has been stripped off the head, leaving a path three inches wide and no trace of burning. Another exhibit was that of a woman of forty, who was struck by lightning, and was unconscious for forty-eight hours. There was no skin lesion, or any difference on the surface of the hair, but next to the scalp the hair though originally well arranged was so twisted and matted by the mechanical action of the current, that it was impossible to work one's finger through, necessitating shaving.

Not the least interesting, especially from the point of view of the medical jurist, are the tracings of the electric discharge, both on organic substances, such as muscle fiber, in which the presence of electricity was proved by a spiral marking, and inorganic material. An example of this latter was an iron portion of an aeroplane, part of a machine which had come down in flames. The catastrophe was attributed to the fault of the pilot. However, the microscope revealed the typical spiral marking of the electrical current and the man's innocence was proved.

In addition to the museum rooms, there is also an amphitheatre, a medical and a technical laboratory, and an ambulance room for casualties. One room which deserves especial attention holds over one hundred water colors of various specimens and a like number of articles of everyday life, illustrating what can be termed almost a new science, "*Spurenkunde der Elektrizität*," on which Professor Jellinek lectured before the Royal Society of Edinburgh July 9, 1936. This collection of thousands of specimens, as was said in one of the addresses, forming as it does part of the cultural work in the Vienna Medical Faculty, is an asset for the whole world, whose value cannot be overestimated.

The Museum of Electropathology I have sketched all too inadequately represents the culmination of thirty-six years original and painstaking labors of Professor Stefan Jellinek, who more than merits the felicitations extended to him on behalf of the scientific world. Indeed, the whole world is deeply indebted to him for having clarified many obscure problems concerning electropathology and for having shown the ways and means to minimize the hazards of the modern electrical industries. The Museum in Vienna reflects great credit on the state, city and university, and is a monument to the earnestness of a great but modest humanitarian physician and savant.

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EDITORIALS

THE YEAR'S PROGRESS IN PHYSICAL MEDICINE

This time of the year is commonly regarded as the appropriate season to balance the gains and losses in every human endeavor. In medicine and the allied sciences it is useful to review such of the contributions that appear to be of permanent value. This of necessity must be curtailed to an abbreviated citation of certain original researches. So far as physical therapy proper is concerned, the year 1936 which has just come to a close, has seen a steady gain in several directions without anything spectacular to record. The experiences gained during the year, while having brought about no striking advances or innovations, have nevertheless added to the sum total of our discipline in a substantial manner.

On passing in review the literary contributions during 1936, one is struck by the steady and positive advances made with hyperpyrexia not only in the clinical management of general paralysis of the insane, as originally indicated, but in other affections, for which this type of general thermotherapy has come well-nigh being a specific. In the light of present knowledge it is now realized that it matters much in the clinical end results whether extra high fevers are introduced and maintained by one or another of the physical agents at our disposal. The fact that high temperature states can be provoked by hydriatic measures, infra-red radiators, high and ultrahigh frequency currents and even by medicinals or suitable combinations of these, is an indication that the choice of method is dictated as much by the agent as by the technic employed. Recent literature has pointed out that substantial amelioration of symptoms may be expected in very high percentages of such intractable and serious conditions as gonococcal arthritis, specific vaginitis with or without pelvic complications, many types of chorea, chronic meningitis and encephalitis under a carefully maintained or prolonged hyperpyretic régime. The successes of the past have given rise to more authoritative expressions of the

clinical advantages to be expected from electropyrexia with definite assurances that not only can patients successfully withstand the heroic fever, but according to Bierman can also be sustained for a longer period than that heretofore advocated. It is an interesting paradox that no sooner was this observation recorded, than a similar and perhaps a more radical one was enunciated abroad; namely, that patients can be subjected to high fevers lasting days or even weeks by means of a medicinal hypnotic during which they are completely asleep. One may therefore conclude that the concept of high fever therapy has not gone the way of other novel procedures, but is entering a state of therapeutic appreciation accorded to tried and proved methods.

Unfortunately for short wave diathermy, its therapeutic possibilities came enunciated under such dramatic promises as to challenge our traditional conservatism. During the past year some of the moot problems that have since arisen have been clarified. Partly through the nature of the ultrahigh frequency and partly through the modified technic of its application we have come to realize that in short wave diathermy we possess a therapeutic agent essentially different from and superior to conventional diathermy. This logically leads to the much disputed question whether or not short and ultrashort waves possesses biologic properties other than thermic and thermopenetrative in character. Schliephake and others have maintained that given apparatus with adequate wattage at a wavelength of about 6 meters, and employing a technic involving appropriate air spacing of the condenser electrodes, thermic effects of greater depth than heretofore attained could be demonstrated even to the point of a certain selectivity for various structures. On the other hand Mortimer and Osborne having been unable to verify by their particular experimental methods these findings, reached the inevitable conclusion that short wave diathermy does not represent as great an advance over conventional diathermy as has been claimed by certain pioneers. It is gratifying therefore that research during the past year, notably by Coulter and his coworkers, has brought about data which on close analysis tend to substantiate those obtained by Schliephake and others. Without entering into details which the interested reader must study in the original, it must suffice here to point out that Coulter has noted an apparently greater depth effect from the coil electrode method of treatment than is attainable with intimately applied plate condenser electrodes, while air spaced condenser technic exceeds both in effectiveness. This research evidently comes in close accord with the basic premises advanced by Schliephake, and is all the more significant because Coulter and his school initiated their labors strictly independent of any similar investigations.

Clinically the year's experience has substantiated the early expectations from the prolonged hyperemic effects attainable by short wave diathermy, as indeed in suitably selected cases results bordering on the specific have been noted. This holds particularly good for many types of pyogenic infections and acute inflammatory processes, be these located in soft or hard structures. While in the chronic process diathermy has long been recognized as of great value, during the year just ended collective experience has again shown the superiority of short wave diathermy. This is explainable by the greater resorptive quality of this agency and perhaps also its deeper penetrative heating property. While not uniformly so, clinical experience in many cases has demonstrated that degenerative processes, notably such as seen in arthritis deformans, have been favorably influenced in the sense of reduction of pain and swelling — a fact no doubt due to the nutritive properties of the prolonged active hyperemia thus invoked. The labors of the past year have shown convincingly that short wave diathermy is not an ephemeral addition

to physical therapy but one that can be relied upon to produce desirable results in properly indicated conditions.

Galvanism at first blush may appear as too old and established a therapeutic measure to require discussion under the heading of progress, but two aspects of applicability of the galvanic current have during the last year been given a new impetus in therapy of sufficient importance to merit earnest attention. The long known electrochemical quality of the current of propelling ions into the structures, as it were, has been employed for the ionization of arthritic joints and certain inflammatory processes of the soft structures by histamine and kindred preparations. The labors of Kling, Kovács and others have demonstrated the therapeutic value of this procedure. In the field of rhinolaryngology, Hollender and others have contributed considerable study to the ionization of the nasal mucosa in certain types of vasomotor rhinitis. While it is not claimed that the measure is curative in the full sense of the word, its palliative effects are so pronounced and even lasting as to be of great therapeutic value. In the field of ophthalmology, Erlanger has elaborated ionizing procedures of such drugs as zinc, histamine, acetylcholine, doryl, dionin which have proved of great promise in the management of inflammatory and ulcerative processes of the conjunctiva and iris. These contributions convey the lesson that in the ceaseless search for new therapeutic methods one often must fall back upon the old, long since grouped in the class of the obsolete.

Considering that ultraviolet radiation has been thoroughly elaborated as a therapeutic agent, it is not surprising that the literature for the past year has brought nothing new clinically except contributions confirmatory of the results obtained in the past. As these contributions are based on scientific methods they naturally are of great usefulness to our discipline. Of particular importance are the exceedingly scientific discoveries by Huldschinsky, which now more than ever have been translated into terms of practical life through the production of Vitamin D in milk, and the use of irradiated substances for arthritis. It should not be overlooked that the present day achievements in these directions are due solely to the genius of Huldschinsky who first brought light in the dark problem of the rational management of rachitis. To this must be added that recent contributions have demonstrated the diagnostic significance of ultraviolet fluorescence with especial reference to the differentiation of tissues, particularly between benign and malignant. While this diagnostic means has not acquired the following it merits, its intrinsic value is such as to justify the belief that it will become recognized as an aid to macro- and microscopic tissue differentiation.

Within the interesting frame of our specialty the year 1936 has not been devoid of fruitful labors in this as well as in general medicine and the allied sciences. Attention is invited to the list of outstanding contributions in the sciences related to medicine published elsewhere in this issue, as it shows the higher plane reached by the sciences in their respective fields.

SIXTEENTH ANNUAL SCIENTIFIC AND CLINICAL SESSION TO BE HELD IN CINCINNATI

Those interested in physical therapy will be glad to learn that the official dates for the sixteenth annual session of the American Congress of Physical Therapy extend from September 20 to 24, 1937. The headquarters will be the Netherland Plaza, one of the finest hotels in this part of the country. The convention committee has been laying plans for a record-breaking attendance and there is every reason to believe that there will be no disappointment. The splendid session held in New York last year is but an indication

of the progress which has already been made. Each annual session sees many innovations, a higher standard of program, better and larger technical and scientific exhibits and increased interest in physical therapy generally.

It is suggested that you plan now to attend this session. If you are teaching physical therapy in one of the medical schools, you will want to attend the teachers' conference. If you are a director of a hospital physical therapy department you will want to hear the symposium on hospital aspects of physical therapy. On the other hand, if you are a general clinician, you will want to familiarize yourself with the numerous advances in fever therapy, electrosurgery, therapeutic exercise, light therapy, and so on.

Every effort is being made to stress the clinical rather than the theoretic aspects of the work. Demonstrations will be more numerous emphasizing the practical side of physical procedures. There will be special, small group sections as in previous years, but they will be limited in attendance to give a more personal touch to the instruction.

The committee on scientific exhibits is endeavoring to have a large display of material. Every member of the Congress, duly licensed physicians, medical societies, teaching institutions and hospitals are invited to reserve space without obligation.

PENNSYLVANIA PHYSICAL THERAPY ASSOCIATION

At the last annual meeting of the Congress the Pennsylvania Physical Therapy Association became officially affiliated with the central organization. The unification of local societies in any field in medicine tends towards strength and greater progress. This is especially true in physical therapy and those who are primarily interested in the newer science can benefit by the mistakes made in the other specialties. State organizations in physical therapy are desirable units. Pennsylvania is to be congratulated in taking such an active interest. More particularly are those physicians to be congratulated who worked zealously to attain this important goal. It is hoped that other states will soon fall in line and that before many years have elapsed physical therapy will be properly represented in the Congress by strong local scientific bodies.

MEMBERSHIP DUES AND SUBSCRIPTION FEES

A plea is made to those delinquent in the payment of their annual dues to remit at this time. The fiscal year commences January 1, and dues are payable on or before this date. If you have already paid disregard this, but if you have not you can materially help the officers and the Congress generally by paying promptly. Delinquent accounts necessitate extra and costly clerical work. Postage also is an item, which means that when several statements are required before a remittance is obtained, the cost of collection actually reduces the income so essential for more constructive purposes. Help your society by taking care of this little matter now. What has been said of membership dues applies likewise to subscription fees. Those whose subscription fees remain in arrears for three months must of necessity be dropped from the ARCHIVES mailing list. In other words avoid interrupted receipt of the ARCHIVES by paying for your renewal on receipt of notice.

Correspondence

Minimal Heating in Short Wave Diathermy

To the Editor:—In your August issue you published under International Abstracts an article on "Tissue Heating by Short Wave Diathermy [Bernard Mortimer and Stafford Osborne, J. A. M. A. 104-1413 (April 20th) 1935]." In this you say, "In their opinion the burden of proof lies on those who claim any biologic action of these currents other than heat production."

From my own clinical observations in some 1250 treatments with the 6 metre wave I have found that I have obtained results without the patient experiencing any sensation of heat, or, at the most, only a slight degree of warmth.

A recent case worthy of mention is that of a boy, age 11 years, suffering from an abscess over the right scapula. He had a temperature of 102 degrees F., and there was extensive swelling of the axilla glands. After the second treatment his temperature dropped to 99.7, and after the fourth was normal. Up till then there had been no drainage at all from the abscess. One the sixth day the abscess was incised and nearly half a pint of pus was expressed through a half inch opening. He made an uneventful recovery. At no time during treatment did he experience any sensation other than gentle warmth at the most. This is only one of several cases I could mention but it indicates that the 6 metre wave has a definite biologic action and that the effects are not due to heat alone.

Yours, etc.,

W. Gordon Rich.

Sidney, Australia.

Comment

We are pleased to publish the above contribution from a colleague of the antipodes as one more of recent ones who have raised the question of effects other than thermic by short wave diathermy. By way of comment it is pointed out that while it has been impossible for obvious reasons to establish absolute proof by phantom experiments, the feeling both here and abroad is gaining ground that wavelengths in the ultrashort region apparently produce therapeutic effects at a minimal production of warmth. At the small degree of heating employed thermic effects may be ruled out almost with certainty justifying the conclusion that the ultrashort waves have therapeutic effects dissociated from thermotherapy.

Our valued correspondent is referred to the contemporary literature, especially the monograph by Saidman and Kahn in which the very founder of the entire discipline of high frequency therapy, Professor d'Arsonval voices his opinion that effects other than those attributable to heat are obtained in short wave therapy. This concept as already alluded to, is gaining ground not only in France, but in many other countries.

Finally our correspondent's attention is invited to the fact that he takes issue with the interpretation put upon the article in question by the abstracter, when in reality the issue should be taken with the authors of the original contribution, whose opinions have been quoted virtually in their own words.

The Editor.

Frederic De Kraft
1861-1936

It is with profound regret that we chronicle the death of Dr. Frederic De Kraft on December 25 last, after a brief illness reported to have been lobar pneumonia. With his demise physical medicine has lost one of its outstanding pioneers, exponents and workers, whose whole professional life in New York City was devoted to furthering scientific problems especially in the domain of high frequency therapy.

Dr. De Kraft was born in Germany, emigrated to the United States at the age of seventeen and completed his classical education at Germantown Acadamy. He graduated in medicine from Jefferson Medical College, Philadelphia in 1883, and at once settled in New York City as a general practitioner. Though he became identified with various hospitals and served in diverse clinical departments, his main interest centered in physical therapy. He was especially interested in diathermy, and this at a time when d'Arsonval's epochal discovery had not yet become common property of the medical profession in the United States. Gifted with a creative mind, he became not only a pioneer in a therapeutic sense but a contributor of apparatus and appliances, notably a spark gap, which facilitated greater therapeutic precision in a technical sense. While not a prolific writer, he nevertheless contributed to the contemporaneous literature on diathermic and electrotherapeutic problems, each contribution containing the products of original research.

Proof for the scientific value of his contributions is seen in the fact that when the American Congress of Physical Therapy, through its Board of Governors, decided before the 1932 convention to bestow a golden key of merit on men who had made outstanding contributions to some part of physical medicine or its allied sciences, and in the year named did choose seven scientists for this signal honor, the name of d'Arsonval suggested itself as the first foreign, and that of De Kraft as the first American choice. This is not the place to discuss the impartiality of the Board of Award, but it is proper to point out that race, nationality or creed play no role in its choice, not even personal services rendered the Congress, candidates for the honor being selected solely on scientific merit. Not even international fame is accepted as a criterion without concrete and convincing proof of outstanding service rendered to the cause of science.

Dr. De Kraft was identified with organized medicine and held positions of trust and honor in a number of eastern physical therapy organizations. With his heart and soul devoted to his vocation, he keenly watched the progress made in high frequency therapy and personally took measures to secure for it full recognition in private and public hospitals and similar institutions in the state of New York.

With his passing at the age of seventy-five the profession sustained an irreparable loss. His memory will be cherished and to all who have been privileged to come in intimate contact with him there is left the heritage of a devotion to ideals which they will emulate in honor of his memory.

To his widow and to his brothers, one of whom is a physician practicing in Germany, we extend our whole-hearted sympathy.

Harry Leslie Langnecker
1876-1936

It is with regret that we record the untimely death towards the end of 1936 of Dr. Harry L. Langnecker, one of the leading and scientific exponents of physical medicine. Those who had the privilege of personally knowing this retiring yet amiable man will not forget that he was one of the few with a profound appreciation of the value of physical therapy, nor that he was in the front rank of those courageous men who valiantly voiced their opinions about this discipline, and this at a time when conservative physicians maintained a poorly receptive attitude toward physical therapy which was passing through the flux of post-war adjustment. It was at that crucial period that Langnecker's opinions and claims did much towards the attainment of recognition by the medical profession of the place and role of physical therapy in general medicine and surgery. A gifted and scientifically trained orthopedic surgeon, Langnecker succeeded in arousing the interest of Leland Stanford University towards the assumption of leadership in scientifically applied physical therapy, a leadership that was not dimmed even in the face of rigid programs and curricula maintained by other universities.

Dr. Langnecker was born in New Brighton, Pa., and received part of his classic education at Phillips Exeter Academy. He continued his collegiate and medical studies at Leland Stanford University and at Johns Hopkins University, from which he was graduated in medicine at the age of thirty. He remained at Johns Hopkins for two years, and next served at the Massachusetts General Hospital until 1915 when he joined Stanford University in a teaching capacity and aided in the organization of a physical therapy department at Stanford Hospital. His work was interrupted by two years war service in the U. S. Navy as a medical officer, at the completion of which he resumed teaching at Stanford as an Associate Professor of Medicine and as Director of the Department of Physical Therapy.

Dr. Langnecker held membership in the American Medical Association and other scientific bodies. His literary contributions on physical therapy were as original as they were fruitful, assuring their author a secure place in the annals of our discipline.

Dr. Langnecker was a widower and is survived by two daughters, Jane Scott and Leslie Ferguson Langnecker, to whom the Congress expresses sympathy in their bereavement.

SCIENCE, NEWS, COMMENTS

HONORS AND CONTRIBUTIONS TO MEDICINE AND ALLIED SCIENCES

Some of the outstanding contributions and honors of the year 1936 in the medical and allied sciences, are listed below. A more detailed review may be found in *Science News Letter*, December 26, 1936, from which issue the data given below have been selected.

Rewards and Recognitions

The Nobel Prize in Physics was awarded jointly to Prof. V. F. Hess, University of Innsbruck, Austria, and Dr. Carl D. Anderson, California Institute of Technology, the former for discovery of cosmic rays and the latter for discovery of a fundamental building-block of matter, the positron.

The Nobel Prize in Chemistry was awarded to Prof. Peter Debye, Kaiser Wilhelm Institute of Physics, Berlin, cofounder of the famous Debye-Huckle theory in physical chemistry which made it possible to calculate exactly the electrical conductivity of a strong electrolytic solution.

The 1936 Nobel Prize in Medicine was awarded jointly to Sir Henry Hallet Dale, director of the National Institute of Medical Research, London, and Dr. Otto Loewi, University of Gratz, Austria, for their discoveries related to the chemical transmission of nervous activity.

Pope Pius XI founded a new Pontifical Academy of Sciences with a total membership of 70 eminent scientists of all nations, including the following Americans: Prof. George D. Birkhoff, Harvard University; Dr. Alexis Carrell, Rockefeller Institute for Medical Research; Prof. Robert A. Millikan and Prof. Thomas H. Morgan, California Institute of Technology; Dr. George S. Sperti, Institutum Divi Thomae of the Ohio Athenaeum; Prof. Hugh S. Taylor, Princeton University.

Prof. Roger Adams, University of Illinois, received the 1936 Willard Gibbs Medal of the American Chemical Society, Chicago Section, for his achievements which include synthesis of new local anesthetics, chaulmoogric acid and allied compounds.

Dr. Edward A. Archibald, McGill University, Montreal, was awarded the Trudeau Medal of the National Tuberculosis Association for introducing the life-saving chest operation, thoracoplasty, into America.

Prof. William Mansfield Clark, Johns Hopkins University, received the William H. Nichols Medal of the American Chemical Society in recognition of his notable researches on hydrogen ion concentrations and their industrial applications.

Dr. James Ewing, Memorial Hospital, New York, was honored with the John Scott Medal of the City of Philadelphia for his research in classifying tumors.

Dr. Ludvig Hektoen, director, John McCormick Institute for Infectious Diseases, was selected as chairman of the National Research Council.

The gold medal for the best scientific exhibit at the annual meeting of the American Medical Association was awarded to Drs. Charles Huggins, W. J. Noona and B. H. Blocksom, University of Chicago, for their demonstration and discovery that a warm temperature—96 degrees Fahrenheit—is necessary for manufacture of blood by bone marrow and that the low temperature of the extremities is the reason why no blood is formed in the marrow of bones of hands, feet, and lower parts of arms and legs in adults.

Dr. Charles F. Kettering, director of the General Motors Research Laboratories, received the Franklin Medal of the Franklin Institute in honor of his "significant and timely contributions to the science of automotive engineering." He was also awarded the John Scott Medal of the City of Philadelphia for invention of the self-starter.

The John Phillips Memorial medal of the American College of Physicians was awarded to Dr. Eugene M. Landis, University of Pennsylvania Medical School, for development of a micro-pipette method of investigating the capillaries.

Dr. Thomas Parran, formerly Health Commissioner of New York State, was appointed by President Roosevelt as Surgeon General of the U. S. Public Health Service.

The $1,000-Prize of the American Association for the Advancement of Science was awarded to Drs. P. W. Zimmerman and A. E. Hitchcock, Boyce Thompson Institute for Plant Research, for their research on the growth-stimulating hormones of plants.

Medical Sciences

Protamine insulinate, called the "most valuable discovery in the treatment of diabetes since the original discovery of insulin," was developed, for use together with ordinary insulin in treating severe diabetes, by Dr. H. C. Hagedorn and associates at Steno Memorial Hospital, Copenhagen.

Apparently one disease was transformed into another when Dr. George Packer Berry, University of Rochester School of Medicine, pro-

duced in rabbits fatal cases of the tumor disease, myxoma, by injections of killed and harmless myxoma virus mixed with the virus of non-fatal rabbit fibroma.

First synthesis of theelin, one of the female sex hormones, was reported by Prof. Russell E. Marker and Thomas S. Oakwood, Pennsylvania State College.

Apparently successful use of preparation, known as Prontosil, in the treatment of beta hemolytic streptococcus infections including scarlet fever, puerperal fever and erysipelas, was reported by Drs. Perrin H. Long and Eleanor A. Bliss, Johns Hopkins Medical School, and in England by Dr. Leonard Colebrook, Medical Research Council, and Dr. Méave Kenny and associates, Queen Charlotte's Hospital, London. The chemical was first prepared and used in Germany four years ago.

Continuous use of the stomach tube to reduce internal pressure in the distended abdomen in cases of acute intestinal obstruction and other severe abdominal conditions was devised and its successful use reported by Dr. Owen H. Wangensteen of Minneapolis, Minn.

Long-sought cause of mussel poisoning, which has resulted in death following the eating of California rock mussels at certain seasons, was traced by scientists at the Hooper Foundation of the University of California to poisonous phosphorescent microorganisms of the sea, *Gonyaulax catenella*, eaten by the mussels.

Detection of radium poisoning became more accurate through the application of a new type of screen-cathode quantum counter developed by Dr. Robley D. Evans, Massachusetts Institute of Technology, and said to be 10 to 100 times more sensitive than older methods of detecting radium in the body.

Better protection against dangerous x-ray burns through the use of a baffle screen which deflects secondary electrons in the x-ray beam was devised by Dr. F. Failla, Memorial Hospital, New York.

A new technique for investigating living matter by obtaining characteristic electrical patterns specific for each species and which, in animals, has already shown characteristic changes in the pattern on the advent of cancer, during ovulation, and other physiological processes was devised by Drs. Harold S. Burr, Cecil T. Lane, and Leslie F. Nims of Yale University.

Neutron rays are more effective than x-rays in killing tumors in animals and may prove more potent in destruction of cancers in humans, Dr. John H. Lawrence of Yale University and his brother, Prof. Ernest O. Lawrence of the University of California, reported, on the basis of studies with the atom-smashing cyclotron invented by Prof. Ernest O. Lawrence.

A chemical explanation of heart failure as a disturbance in the breaking down and rebuilding by individual heart muscle cells of phosphocreatine was worked out by Drs. George Herrman and George Decherd, University of Texas School of Medicine.

A test for sense of smell and for fatigue of this sense, which may be useful in locating brain tumors, was developed by Drs. Charles A. Elsberg, Irwin Levy and Earl D. Brewer at the Neurological Institute, Columbia University.

A nervous mechanism that acts as a thermostat to regulate body temperature was found in the hypothalamic region of the brain by Dr. S. W. Ranson, Northwestern University Medical School.

Once-fatal Addison's disease, due to injury or disease of the adrenal glands, may be successfully treated without the use of cortical hormone by giving a diet low in potassium and containing proper amounts of salt and sodium citrate, members of the staff of the Mayo Clinic found.

First operation on the pituitary gland to refeminize a "bearded lady," with successful results lasting one year, was reported by Dr. H. Lisser, University of California Medical School.

Vaccination against ivy poison by subcutaneous injections of the irritant from poison ivy plants was accomplished in a group of CCC men by Lieutenant-Colonel J. M. Blank, U. S. Medical Reserve Corps, and Dr. Arthur F. Coca, Pearl River, N. Y.

Influenza can be more widely spread through the air than previously supposed, but ultraviolet light kills the influenza virus suspended in droplets in the air, studies by Drs. W. F. Wells and H. W. Brown, Harvard School of Public Health, indicated.

Ultraviolet light sterilization of the air in operating rooms was introduced as a means of successfully reducing infections of surgical wounds by Dr. Deryl Hart, surgeon-in-chief, Duke Hospital, Durham, N. C.

Surgical operations were performed on hemophiliacs without post-operative hemorrhage by means of high frequency electroscalpel and coagulation unit, Drs. Warfield M. Firor and Barnes Woodhall, Johns Hopkins Hospital, reported.

Improved rabies vaccine, free from potentially dangerous nervous tissue, was made from culture virus by Drs. Leslie T. Webster and Anna D. Clow, Rockefeller Institute.

Picrotoxin is an antidote for overdoses of luminal and other barbiturates, Drs. T. Koppanyi, J. M. Dille and C. R. Linegar, Georgetown University Medical School, reported.

Epileptic seizures were predicted by electrical studies of the brain conducted by Drs. F. A. Gibbs and W. G. Lennox, Harvard Medical School.

Use of blood from the newly dead for transfusion to living persons was undertaken at the Central Emergency Hospital, Moscow, and results in nearly 1,000 cases were reported by Dr. S. S. Yudin, surgeon-in-chief.

Five wavelengths comprise the portion of ultraviolet light curative of experimental rickets by

irradiation, and of these the one which is most effective rarely reaches the earth in sunshine, Prof. John W. M. Bunker and Dr. Robert S. Harris, Massachusetts Institute of Technology, reported.

Biology

First stages in embryonic development of rabbit ova were started by treatment of unfertilized ova with chemicals and heat, in the laboratory of Dr. Gregory Pincus, Harvard University.

Fruits without seeds were formed by unpollinated flowers when growth-promoting acids were applied to their ovaries, in experiments by Dr. Felix G. Gustafson of the University of Michigan.

Dr. Ross G. Harrison of Yale University showed that the polarity of protein molecules brings about proper relationship of various parts of the animal body during early embryonic development.

Transplanted salamander hearts lived and continued beating, in experiments by Drs. W. H. Wright and H. H. Collins, University of Pittsburgh.

Successful transplantation of a leg from one white rat to another was accomplished by Dr. J. V. Schwind, Loyola University School of Medicine, Chicago.

Elaborate apparatus for rearing animals and plants totally free of any kind of microörganisms was perfected at Notre Dame University by Prof. J. A. Reyniers.

Surgical transplantation of eyes, ovaries, and other organs in insects only a sixth of an inch long was described by Drs. Boris Ephrussi and G. W. Beadle, working first in Paris and then at the California Institute of Technology.

That cells "drink" fluid from their surroundings was demonstrated by Dr. Warren H. Lewis, Department of Embryology, Carnegie Institution of Washington.

Evolutionary changes in a fungus were produced by secondary cosmic rays, in experiments by Drs. B. Rajewsky, A. Krebs, and H. Zickler of Frankfurt-am-Main, Germany.

Green light is poisonous to one-celled plants, Dr. Florence E. Meier, Smithsonian Institute, discovered.

Milk was successfully shipped for long distances by first concentrating and then freezing it, in a process developed by the U. S. Department of Agriculture.

Experiments on a commercial scale were made with the method of growing large crops of vegetables and flowers in tanks of electrically warmed nutrient solution originated by Prof. William Gericke of the University of California.

Chemistry

Artificial production by chemical methods of beri-beri-preventing vitamin B_1 was achieved by Dr. R. R. Williams and associates at Columbia University and the Bell Telephone Laboratories and Dr. J. K. Kline of Merck and Co.

A process for preserving milk for several months by packing it under pressure with oxygen and shipping it refrigerated was developed by the German inventor Theodore Hofius.

Enzymes, the highly complex proteins that make digestion, body oxidations and other physiological processes possible, can be formed out of inactive proteins by suitable chemical changes and heating, reported Dr. J. H. Northrop, the Rockefeller Institute for Medical Research.

The first power alcohol plant in America started operations at Atchison, Kans., under the sponsorship of the Chemical Foundation and is producing ethyl alcohol for blending with gasoline as a motor fuel.

The oxygen in the air man breathes is heavier than the oxygen in the water he drinks by six parts in a million, it was shown by experiments of Dr. Malcolm Dole, Northwestern University.

A chemical derivative of corn product wastes yields an explosive known as hexanitroinositol which is more powerful than nitroglycerin, reported Prof. Edward Bartow, president of the American Chemical Society.

Phthalic acid was combined with paints to reduce the action of ultraviolet light upon them.

A powerful antiseptic made from oat hulls was developed by Drs. N. M. Phatak and C. D. Leake, University of California Medical School.

Physics

One of the fundamental forces of nature—the binding energy between the cores of two hydrogen atoms—was measured by Drs. M. A. Tuve, N. P. Heydenburg and L. R. Hafstad, Carnegie Institution of Washington.

First synthesis of a naturally occurring radioactive element was achieved in atomic bombarding experiments on bismuth by Dr. J. J. Livingood, University of California.

Particles of 11,000,000 electron-volt energy for use in atomic disintegration experiments were produced by Prof. E. O. Lawrence, University of California.

Measurement of 17 million-volt gamma ray, produced by bombardment of Lithium with protons, was made by cloud chamber observations of pairs produced by Prof. C. C. Lauritsen and his colleagues, California Institute of Technology.

A high efficiency radio oscillating circuit said to have usefulness in television, radiothermy, extremely high voltage x-rays and for experiments in atomic disintegration was developed by Dr. William Hansen, Stanford University.

Experiments with radio waves only six inches long which travel along hollow tubes were simultaneously announced by Dr. G. C. Southworth, Bell Telephone Laboratories, and Dr. W. L. Barrow, of Massachusetts Institute of Technology.

A long-lived artificial radioactivity of a

beryllium-aluminum alloy with a half life of at least 10 years was discovered by Dr. Edwin McMillan, University of California.

An obsolete 130,000-pound electro-magnet at Annapolis, Md., was moved to Columbia University for use in experiments on atomic disintegration.

A new experimental check on the Einstein theory of relativity by studying the motions of binary stars was advanced by Prof. Tullio Levi-Civita, University of Rome.

The human skin is more sensitive to small temperature differences than are the most sensitive thermometers, reported Dr. J. D. Hardy and T. W. Oppel, Russell Sage Institute of Pathology and New York Hospital.

Intense audible sounds were made to produce light in 14 different liquids by Dr. L. A. Chambers, University of Pennsylvania Medical School.

Seven hours of treatment with intense sounds will age whiskey an amount equivalent to four years in the wood, reported Dr. L. A. Chambers, University of Pennsylvania.

Psychology and Psychiatry

A new tool for study of the mentally ill was suggested by Dr. T. W. Forbes, New York State Psychiatric Institute, by the discovery that the psychogalvanometer, or "lie detector," can distinguish two electric waves from the skin, one of which betrays excitement in the subject even when he is unaware of feeling it.

Learning may be observed at the moment it takes place, indirectly through observation of the brain's electric potential during the process, Dr. Herbert H. Jasper, Brown University, found.

Use of the rhythmic electric impulses from the brain to locate defective areas in that organ was reported by Drs. H. H. Jasper and H. L. Andrews, Brown University.

Brain waves may be used as a mark of distinction between individuals, Drs. Lee Edward Travis and Abraham Gottlober, State University of Iowa, found.

The hypnotic trance is not the same physiologically as natural sleep, electric potentials from human brains under the two conditions demonstrated to Drs. E. Newton Harvey, Princeton, Alfred L. Loomis and Garret Hobart, Loomis Laboratory.

Decreased sugar in the blood increases acuity of hearing, Dr. W. J. Brogden, University of Illinois, found by x-raying the pituitary glands of dogs and by experiments with a diabetic patient.

Phenobarbital, a commonly used hypnotic drug, retards learning of rats but does not affect their forgetting, Dr. Griffith W. Williams, University of Rochester, found.

Fever and also increased blood pressure and pulse rate can be produced by suggestion, Dr. M. Kershaw Walsh, University of South Carolina, reported.

Insulin was used in Europe to treat the mental disease schizophrenia, and it is claimed restored patients to sanity.

Disturbance of a part of the brain, the hypothalamus, may be the primary factor in the important mental disease schizophrenia, Drs. Isidore Finkelman and Daniel Haffron, Elgin, Ill., concluded from evidence that the hypothalamus controls oxygen consumption and other body mechanisms which are upset in the mental disease.

Patients can be brought out of the death-like stupor of schizophrenia by hypodermic injection of brandy, Drs. N. V. Kantorovich and S. K. Constantinovich, Medical Institute and Psychiatric Hospital, Leningrad, reported.

First International Conference on Fever Therapy, College of Physicians and Surgeons, Columbia University, New York City, March 29th to 31st, 1937

The First International Conference on Fever Therapy will hold its sessions on March 29th, 30th and 31st, 1937, at the College of Physicians and Surgeons, Columbia University, New York City. The first day will be devoted to the discussion of physiology, pathology, and methods of production of fever.

The second day, to consideration of miscellaneous diseases treated by fever, such as chorea, rheumatic carditis, ocular diseases, arthritis, leprosy, meningococcus infections, undulant fever, tuberculosis, tumors, skin diseases, etc.

The morning of the third day to the hyperpyretic effects on syphilis. In the afternoon of the same day to the treatment of gonorrhea by fever.

Those desiring to participate are requested to communicate before February 15 with the General Secretary, Dr. William Bierman, 471 Park Avenue, New York City. The registration fee is $15.00.

Baron Henri de Rothschild, *Chairman*,
Paris, France.

Dr. William Bierman, *Secretary*,
471 Park Avenue,
New York City, U.S.A.

Latin-American Congress of Physical Therapy

The Eastern delegation of the Latin American Congress of Physical Therapy, X-ray and Radium will sail on the United Fruit Company S.S. "TELA" from Philadelphia on March 9th. The Southern and Western members will sail from New Orleans on the S.S. "SANTA MARTA" on March 10th.

Only ten more can be accommodated on the Philadelphia boat and nine more on the boat from New Orleans.

The Guatemalan Government has arranged a special ten per cent reduction in fare for registered members of this Congress.

For application and registration for passage apply to Dr. Norman E. Titus, M.D., 730 Fifth Avenue, New York.

Physical Therapy Organizations

In this permanent column will be published information about meetings, election of officers, etc., of physical therapy organizations. New data should be sent promptly to the office of the Secretary, 1100 Park Avenue, New York.

Meetings in 1937

American Congress of Physical Therapy; Cincinnati, September 20th to 24th; Dr. Richard Kovács, 1100 Park Avenue, New York, Secretary.

Mid-Western and Southern Sections American Congress of Physical Therapy will meet jointly with the St. Louis Medical Society, March 9, 1937. Dr. F. H. Ewerhardt, Chairman, Program Committee, 600 South Kingshighway, St. Louis, Mo.

New York Physical Therapy Society; meetings at the New York Academy of Medicine, on first Wednesdays from October to May; Dr. Madge C. L. McGuinness, 1211 Madison Avenue, New York, Secretary.

Kings County Medical Society, Physical Therapy Section; meetings at 1313 Bedford Avenue, Brooklyn, bi-monthly on second Thursdays; Dr. H. T. Zankel, 5 St. Paul's Place, Brooklyn, Secretary.

Medical Society of the State of New York, Session on Physical Therapy; Rochester, New York, May 26th; Dr. H. J. Harris, Westport, New York, Secretary.

Pennsylvania Physical Therapy Association; meetings at the Philadelphia County Medical Society Building, third Thursdays from September to June; Dr. Arno L. Zack, 216 East Broad Street, Bethlehem, Pa., Secretary.

New England Physical Therapy Society; meetings at Boston on second Wednesdays from October to June; Dr. William McFee, 41 Bay State Road, Boston, Mass., Secretary.

Pacific Physical Therapy Association; meetings at Los Angeles, fourth Wednesdays;

Latin-American Congress of Physical Therapy; Guatemala City, March 15th to 21st; Dr. C. L. DeVictoria, 1015 Lexington Avenue, New York, Secretary.

First International Conference of Fever Therapy; New York, March 29th to 31st; Dr. William Bierman, 471 Park Avenue, New York, Secretary.

New York Physical Therapy Society Meeting

The regular January meeting of the New York Physical Therapy Society will be held at the Montefiore Hospital, January 6 at which the following program will be presented:

1. "Historical Studies on Electrophoresis", by J. Byer, M.D.

2. "Development of Collateral Circulation Following Experimental Vascular Obstruction", by I. D. Stein, M.D.

3. "Chemistry of the Peripheral Blood in Vascular Disease of the Extremities", by Karl Harpuder, M.D., and I. D. Stein, M.D.

4. "Clinical Report on Some New Applications of Electrophoresis", by Karl Harpuder, M.D.

Discussion will be opened by Irving S. Wright, M.D.

(*Continued from page 33*)

We may reasonably expect a growing interest in this agency which promises to be one of the most potent therapeutic measures available to the profession.

471 Park Avenue.

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5. Carpenter, C. M.; Boak, R. A.; Mussi, L. A., and Warren, S. L.: The Thermal Death Time of Neisseria Gonorrheae in Vitro, J. Lab. and Clin. Med. **18**:981 (July) 1933.

6. Vesell, H., and Bierman, W.: The Electrocardiogram in Fever, Am. J. Med. Sc. **191**:484 (April) 1936.

American Registry of Physical Therapy Technicians — Examinations and Approved Schools

The American Registry of Physical Therapy technicians calls attention to the fact that the results of the recent examinations held in New York City and Pasadena, will, it is believed, be made known within the next 60 days. This delay in announcing the graded reports of applicants is due to the large number of papers to be reviewed by the individual examiners of the board. On account of the number of inquiries with reference to the approved and recommended institutions teaching physical therapy, there is reproduced on the next page in tabulated form the names of schools for physical therapy technicians published by the *Journal of the American Medical Association* in its educational number. — [*Medical Education, in the United States and Canada* **107**:678 (August 29) 1936.] For table of approved schools, turn to next page.

Schools for Physical Therapy Technicians Conforming to the Standard Adopted by the American Medical Association in 1936

School	Director	Prerequisite for Admission	Length of Course	Student Capacity	Tuition	Certificate Diploma, Degree
Children's Hospital, Los Angeles[1]	Miss L. H. Graham, R.N.	(a) R.N. (b) Grad. phys. ed.	12 mos.	6	$125	Diploma
Stanford University Hospitals, San Francisco	W. H. Northway, M.D., Acting Director	(a) R.N. (b) Grad. phys. ed.	12 mos.	9	$175-$250	Certificate
Walter Reed General Hospital, Washington, D. C.[2]	Maj. W. W. McCaw, M.D.	Grad. phys. ed.	12 mos.	10	None	Certificate
Northwestern University Medical School, Chicago[3]	J. S. Coulter, M.D.	(a) R.N. (b) Grad. phys. ed.	9 mos.	12	$200	Certificate
Bouvé-Boston School of Physical Education, Boston[4]a	Miss C. K. Greene, P.T., in charge	Grad. high school	3 and 4 yrs.	10	$400 per yr.	Diploma (3 yrs.) B.S. (4 yrs.)
Harvard Medical School, Course 445, Boston[5]	F. R. Ober, M.D.	(a) R.N. (b) Grad. phys. ed.	9 mos.	16	$150	Certificate
Boston University, Sargent College of Physical Education, Cambridge, Mass.[6]	Prof. E. Hermann, Dean	Grad. high school	4 yrs.	29	$365 per yr.	B.S.
Battle Creek College, Battle Creek, Mich.[7]	Paul Roth, M.D.	(a) R.N. (b) Grad. phys. ed.	12 mos.	....	$180 per yr.	B.S.
St. Louis University School of Nursing, St. Louis[8]	A. J. Kotkis, M.D.	Grad. high school	4 yrs.	6	$200 per yr.	B.S.
University of Buffalo, Buffalo[9]	G. G. Martin, M.D.	R.N.	18 mos.	6	$10 per univ. credit	B.S.
D. T. Watson School of Physiotherapy, Leetsdale, Pa.[10] (affiliated with the Univ. of Pittsburgh School of Medicine)	Jessie Wright, M.D.	(a) Grad. phys. ed. (b) 2 yrs. premed.	22 mos.	8	None	Diploma
College of William and Mary, Richmond, Va.[11]	Thomas Wheeldon, M.D.	(a) R.N. (b) Grad. phys. ed.	9 mos.	6	Coll. fee	Certificate
University of Wisconsin, Madison, Wis.[12]b	E. A. Pohle, M.D.	(a) R.N. (b) Grad. phys. ed.	12 mos.	20	Univ. fee	Certificate
Hospital for Ruptured and Crippled Children, New York City	K. G. Hansson, M.D.	(a) R.N. (b) Grad. phys. ed.	9 mos.	14	$300	Diploma

Notes

a. Four year course leads to B.S. degree from Simmons College.

b. M.S. degree for advanced work.

Affiliated Clinical Facilities

1. Cedars of Lebanon Hospital, Good Hope Clinic and Los Angeles County Hospital, Los Angeles, and Glendale Sanitarium and Hospital, Glendale.

2. Weightmann School for Crippled Children, Washington, D. C.

3. Illinois Central Hospital, Michael Reese Hospital and St. Luke's Hospital, Chicago.

4. Boston City Hospital, Children's Hospital, Massachusetts General Hospital and Robert Breck Brigham Hospital, Boston; Cambridge Hospital, Cambridge, and New England Peabody Home for Crippled Children and Newton Hospital, Newton.

5. Boston Home for Incurables, Convalescent Home of the Children's Hospital, Children's Hospital, Harvard Infantile Paralysis Commission, Industrial School for Crippled and Deformed Children, and Robert Breck Brigham Hospital, Boston, and Cambridge Hospital, Cambridge.

6. Massachusetts General Hospital, Massachusetts Memorial Hospitals and Industrial School for Crippled and Deformed Children, Boston, and Cambridge Hospital, Cambridge.

7. Ann J. Kellogg School and Battle Creek Sanitarium, Battle Creek.

8. Firmin Desloge Hospital, St. Louis.

9. Buffalo City Hospital, Buffalo.

10. Allegheny General Hospital, Children's Hospital, Falk Clinic, Industrial Home for Crippled Children and St. Francis Hospital, Pittsburgh.

11. Sheltering Arms Hospital and Stuart Circle Hospital, Richmond.

12. State of Wisconsin General Hospital, Madison.

THE STUDENT'S LIBRARY

ELEMENTS OF PHYSICAL THERAPY. By *William W. Worster*, A.B., A.M., M.D. President and Founder Calif. College of Medical Technicians. Former Professor Clin. Medicine, College Medical Evang. Former Professor of Biology Union College (Neb.). Former President Pacific Physical Therapy Assn.; Fellow American Congress Physical Therapy. Fellow of the American Medical Association. Author of "The Office Laboratory." Third Revised and Enlarged Edition. Cloth. Pp. 307. Published by the Author, San Gabriel, Calif., 1936.

Although the title seems to indicate that this small volume presents merely the fundamentals of physical therapy, the subject matter has been so well organized that it may well be accepted as a clinical guide to the employment of every known physical agency. The author has long been a successful teacher and the present book is the outcome of his rich experience. He properly introduces the subject of physical therapy to novices and ably proceeds to describe light, low frequency currents, conventional and short wave diathermy, static electricity, thermotherapy, hydrotherapy, massage, exercise, muscle regeneration and training, colon therapy and kindred subjects through 18 chapters. In the remaining 9 chapters he graphically describes the diverse technics of physical therapy according to clinical indications. Pulmonary and gastric disorders are followed by arthritis and neuritis, the treatment of high blood pressure, the management of tonsillar affections, hemorrhoids, affections of the skin, the use of physical therapy in diseases of women and of the genitourinary apparatus and many other minor conditions are discussed in a lucid and practical manner. The text is enhanced by 153 unusually well executed photographic and diagrammatic illustrations. Good print on thick paper makes its perusal a pleasure. There is also a carefully prepared index facilitating rapid orientation. The book as a whole is recommended not only for beginners, but for advanced students and general practitioners interested in physical therapy, both as a refresher course and as a terse but highly satisfactory manual.

REPORTS ON CHRONIC RHEUMATIC DISEASES: Being the Annual Report of British Committee on Chronic Rheumatic Diseases. Edited by *C. W. Buckley*, M.D., F.R.C.P. Number two. Cloth. Pp. 140. Price, 10 s. 6 d. London: H. K. Lewis & Co., Ltd., 1936.

This volume embodies the point of view held by our British colleagues and is of interest for those studying chronic arthritis in its broadest aspect. It presents accounts of clinical observations and laboratory research which the British Committee on Chronic Rheumatic Diseases believe to be of real value. It includes chapters entitled Chronic Infective Arthritis by Davidson; On a Tuberculous Factor in the Aetiology of Certain Cases of Rheumatoid Arthritis by Copeman; The Aetiological Relationship of Streptococcus Haemolyticus to Rheumatoid Arthritis by Griffiths; Recent American Researches on Diseases of Joints and Related Structures by Hench; Prevention and Treatment of Deformity in the Rheumatoid Type of Arthritis by Fisher; Note on Research Into the Biochemistry of Joints by Dodds; The Metabolism of Joint Tissues by Bywaters; The Psychological Aspects of Chronic Rheumatic Joint Disease by Ellman and Mitchell; Recent Laboratory Studies in Rheumatic Diseases by Race; Rest and Chrysotherapy in the Treatment of Rheumatoid Arthritis by Buckley, and Abstracts and Reviews from Continental Journals by Bach and Pether.

From what has been pointed out, the above report has attempted to present an inclusive review of the present opinions regarding the causative, preventive and therapeutic concepts of chronic rheumatic diseases. This opinion or point of view differs little from that now accepted in other countries and leaves the reader with the conviction that our British confreres have entered into an intensive campaign to control and eradicate this protean disease from their midst. It is a work deserving serious consideration of the medical profession of any country.

A DESCRIPTIVE ATLAS OF RADIOGRAPHS—An Aid to Modern Clinical Methods. By *A. P. Bertwistle*, M.B., Ch.B., F.R.C.S., Ed. Third Edition. Cloth. Pp. 569 with 808 illustrations. Price, $13.50. St. Louis: The C. V. Mosby Company, 1936.

The epochal contribution of Roentgen is here partially crystallized in the form of an atlas of radiograms, which also is a great tribute to the pioneering efforts of the many students and martyrs in radiology who helped to advance this discipline to its present high status in diagnostic medicine. While the word "partially" is here used advisedly because the concept of roentgenology implies also therapeutic advantages not obtainable by other procedures, the work under consideration is nevertheless a significant document of the cumulative efforts of past and present workers to demonstrate its diagnostic importance in modern clinical methods. The third edition has been materially revised and enlarged and is dedicated to the late Sir James Mackenzie who was a brilliant pioneer in the use of x-ray for diagnostic purposes. As pointed out by Bertwistle, the Atlas has been written by a clinician for clinicians. Hence one finds that throughout the large text, attempts are made to portray as far as possible contrasting pictures of normal with abnormal views and to reveal to the clinician the practical value and certain pitfalls in the application

of radiology for accurate diagnosis and scientific treatment. Forty-four contributors have made it possible to review in detail the growth and precision with which modern radiography is employed and the detail which may be elicited for greater clinical use. A chapter panoramic in objective, is presented in the beginning of the work under the title of milestones in radiodiagnosis. It is an historic review in outline style of the contributions that have been added to this study since Roentgen first demonstrated the bones of his hand in silhouette. Since then as illustrated in the volume, radiodiagnosis has brought forth important information with reference to the skeletal, muscular and vascular system and the internal organs of the body. Accuracy in diagnosis of many affections is today regarded as incomplete unless substantiated by roentgenograms. This book is a splendid contribution in that it has presented in clear description and illustrations the many possible aberrations in living human pathology encountered in clinical practice. It is a book that should be within easy reach for reference for both roentgenologist and general practitioner.

PHYSIOLOGICAL CHEMISTRY. By *J. F. McClendon*, Ph.D., Professor of Physiological Chemistry, Medical School, University of Minnesota, Minneapolis, and the late *C. J. V. Pettibone*. Cloth. Pp. 454 with 34 illustrations. Sixth Edition. Revised and Enlarged. Price, $3.50. St. Louis: C. V. Mosby Company, 1936.

It has been pointed out that physiological chemistry represents the biotic manifestations, the *"Sturm and Drang"* within the larger frame of physiologic activity. It is as important for students of medicine to become familiar with the nature of living reactive processes, the so-called vital bricks, as with the superstructure in which they play their more detailed and individual role. The book under consideration has for nearly two decades been read as a text in a number of colleges for this purpose, and in its present edition (sixth) shows that it has been materially revised and brought down to date. In its present format the work may be regarded as comprehensive in exposition for both medical and advanced students; that is to say, those who have had preparatory training in general and organic chemistry. The text is divided into two sections. Of the chapters in part 1, attention is directed to the exposition of the important correlationship of physical to physiologic chemistry, a relationship that increasing experience in the domain of biochemistry and physics has made obvious. That the authors have attempted to present a balanced and well organized exposition is demonstrated by the topics under consideration. Chapters have been devoted to such leading interpretations as the nature and chemical influence of the elements that constitute living tissue, inorganic salts, water; fats, phospholipins; galactolipins; sterols; carbohydrates; proteins; vitamins; blood; tissues; foods; speed of reaction; enzymes; digestion in the mouth, stomach and intestines; absorption; urine; metabolism of proteins, fats, carbohydrates and salts; energy exchange; and internal secretions. As already alluded to, the majority of these chapters have been largely or entirely rewritten. The chapters on enzymes, energy and exchange and internal secretions are new in contribution to this edition. The second part of this work is devoted to laboratory study intended to cover the field of the text. This volume can be recommended to the student of physiological chemistry.

A TEXTBOOK OF PATHOLOGY. By *W. G. MacCallum*, Professor of Pathology and Bacteriology, The Johns Hopkins University, Baltimore, Maryland. Sixth Edition. Cloth. Price, $10.00. Pp. 1277 with 697 illustrations. Philadelphia and London: W. B. Saunders Company, 1936.

The value of this popular textbook on pathology is evidenced by the fact that since 1920 six editions have been published to satisfy the demands made for it by the medical profession. It has been thoroughly revised in accordance with the studies made by the author and has been brought down to date as a representative contribution to the concerned literature. The progress made in the domain of endocrinopathies, the knowledge gathered about vitamin deficiencies and virus infection have received especial consideration because of their comparative newness and clinical importance. The author has based his work on the scientific concept that it is far better to view pathologic processes from the standpoint of their general effect rather than on individual organs. Beginning with the thought that departures from health are brought about by some harmful disturbing agency, MacCallum has endeavored to trace these changes to their causes and to describe the anatomic alterations, the functional disturbances and the reactive processes tending to bring about a restoration to normal as a comprehensive and related subject. This viewpoint is of especial value to general practitioners who can study this volume much as they would a treatise on clinical medicine. Considering the basic importance of the subject matter, the present textbook is recommended to all interested physicians and surgeons as representative of a scientific concept of the nature of pathologic processes in man. Mechanically the book leaves nothing to be desired, especial mention being due for the splendid illustrations which enhance the instruction afforded by the text.

INTERNATIONAL ABSTRACTS

Temperature Coefficient of Production of Erythema by Ultraviolet Radiation. Janet Howell Clark.

Am. J. Hyg. **24**:334 (Sept.) 1936.

Ultraviolet radiation produces a number of well known biologic reactions. Some of the more familiar of these are the production of skin erythema, the destruction of enzymes, the activation of ergosterol, the denaturation of proteins, and the lethal action on microorganisms. It has been suggested by Lewis that the erythema produced in the skin is due to the liberation of a chemical substance which he calls the H-substance because of its histamine-like action. This substance may exist preformed or in loose combination in the cells of the skin and be liberated as the result of cell destruction.

In the coagulation of proteins by radiation the first process, light denaturation of the protein molecule, is this type of physical change, but in itself is not sufficient to produce coagulation. Isoelectric, salt-free egg albumin exposed to ultraviolet radiation at 4 degrees C. is denatured but remains clear. The second step in the coagulation process is a chemical reaction between the light-denatured molecule and water which has the high temperature coefficient of 10+ when the temperature coefficient is taken as the ratio of the velocity of the reaction at 40 degrees C. to the velocity of the reaction at 30 degrees C. It is perhaps similar to the heat denaturation of egg albumin but it takes place at a lower temperature. Heat denaturation of proteins does not proceed at an appreciable rate below 50 degrees C., whereas the heat change following light denaturation takes place at an appreciable rate of 10 C. and proceeds rapidly at 40 C. The final step in the coagulation process is the flocculation of light and heat altered molecules to form a visible coagulum.

Action of Short Waves on the Blood Capillaries. P. Cignolini, and A. Olivvieri.

Radiobiologia Generalis **4**:15 (Oct.) 1935.

The authors observed the interdigital webs, mesenteries and tongues of frogs, under a microscope in a short wave field. Depending upon the strength of current employed, they found: (a) with small doses, an acceleration of blood flow and a slight dilatation of the capillaries, arterioles and venules; (b) with moderate doses, a constriction of the capillaries and arterioles, and a slowing of the capillary and venous current; (c) with stronger irradiation, there was an ischemia with almost complete occlusion; (d) with very great output, a transient vasoconstriction, then vasodilatation, acceleration of blood flow, then finally a slackening ending in stasis. They feel that the capillaries responded to short wave exposures, just as they do to heat and traumatic stimuli. The authors think that these experiments furnish a basis for clinical dosage, and claim that their results substantiate clinically observed facts in relation to dosage. They conclude that it is necessary to avoid not only the intense doses as in (d), but the stronger ones as in (c), in clinical therapy.

Treatment of Pelvic Inflammation by Iontophoresis of Acetyl-Beta-Methylcholine-Chloride. Adolph Jacoby.

Am. J. Obst. & Gynec. **31**:1 (Jan.) 1936.

Recently a group of drugs has been made available, each of which produces vasodilatation and hyperemia. Among such drugs are acetylcholine, histamine, and acetyl-beta-methylcholine-chloride, which seems to be the most effective.

It is administered with the patient in the lithotomy position. A bivalve speculum is inserted and the vaginal vault exposed. All excess of secretion is wiped away. Several thicknesses of gauze 6 inches square are soaked in 20 cc. of a 1 per cent solution prepared by dissolving 1 mg. of the drug in 100 cc. of distilled water. The square of impregnated gauze is carefully spread out against the entire vault of the vagina. A thin vaginal electrode, with the active end wrapped in gauze and soaked in the 1 per cent choline solution is placed firmly against the gauze pack. The speculum is withdrawn leaving the electrode in place. This electrode is attached to the positive pole of a galvanic apparatus. A flat dispersive pad 6 by 8 inches, well moistened in warm water, is placed on the lower abdomen and connected to the negative pole. To insure an even contact, a sandbag is placed over the negative pad and the patient is directed to press it firmly against the skin. The current is turned on gradually to 15 or 20 milliamperes and allowed to flow for 20 or 30 minutes. The current is then slowly shut off and the electrode and vaginal gauze removed. The amount of acetyl - beta - methylcholine - chloride thus introduced has been found to be 31 per cent or 62 mg. This corresponds closely with the estimated amount of 24 per cent or 48 mg. which should theoretically be introduced by this technic. No douches are prescribed at any time. The treatment is repeated every other day. No local reaction is noticed by the patient, but there is usually a generalized sweating, flushing, and sense of warmth, with marked salivation during the treatment. In some instances there is an initial drop of blood pressure. When the general reaction is too pronounced, the application is in-

terrupted, and 1/150 gr. atropine sulphate is given hypodermically. This acts as a physiologic antidote and immediately counteracts all untoward symptoms.

Hysterical Paraylsis and Its Treatment. Abraham Myerson.

J. A. M. A. **105**:1566 (Nov. 16) 1935.

Hysteria is a fusion of conditions that resemble but are not identical with one another. From the hysterical state that is a total alteration of personality to the case in which hysterical manifestations appear as a sort of foreign body in the personality is a wide gap, which extends from an innate or constitutional disorder to an easily curable condition.

This is illustrated by the case of a young man, whose early history was entirely negative for neurotic or hysterical manifestations, while playing football eight weeks before he was knocked unconscious for one and one-half hours and was hazy the next day. In the hospital it was stated that there was a fracture of the first lumbar vertebra. He stated that both legs felt paralyzed and anesthetic at first. He was unable to use the right leg, although the left leg had entirely recovered. The right leg was "numb" as well. Physical examination was entirely negative except for the right leg. The knee jerks on both sides were lively and equal. Ankle jerks were lively and equal. There was no Babinski reflex. There was almost complete anesthesia below the right knee. The anesthesia ran circularwise around the leg in typical hysterical fashion. The immediate psychogenesis of the situation seems simple enough. There was undoubtedly some cord injury at first, which set up a numbness of the legs and weakness. This disappeared but left behind it a state of fear and one of amnesia for the proper use of the muscles of the legs. This condition was explained to the patient. He was told that he would be able to walk when he left the office. A powerful electric current was given to the muscles of the front of the leg. They contracted vigorously. This continued for a few minutes. The patient was told to watch the muscles contract, and it was stated to him that he must try to help the electric current and contract the muscles with each stimulation. In a short time the current was discontinued surreptitiously, and the patient continued to move his leg perfectly well and walked out of the office with no drag whatever to his leg.

In the case of a strong and powerfully built boy who twisted his back, the patient had pain but felt well, continuing to play football until 6 days later when he had severe pain in the front of the body near the pelvis and running up the abdomen. The pain was so severe that he took to bed and has remained there ever since. A surgeon found no orthopedic abnormality and referred him for neurological study. The patient was supported by others when he walked; he dragged both legs. There was very slight flexion of the thigh on the hip, slight extension of the leg on the thigh, and foot-drop on both sides. It was explained to him that his entire condition was due to fear; that he would be able to walk if he put himself into a calm frame of mind and that the separation of the symphysis, of which he had been informed, was of no practical consequence. Rapid passive motions were made, and he was asked to cooperate as best he could. After a dozen or more such passive motions had been made the leg was suddenly released, and it was found that he was using his leg with force and precision. There was a remarkably quick transition from helplessness to perfect control of motions of the legs.

Artificial Fever Therapy. Robert M. Stecher.

Physiotherapy Rev. **16**:10 (Jan.-Feb.) 1936.

The author presents statistical experience with fever cabinet therapy extending over a period of eighteen months during which time about 850 treatments were administered to 150 patients with various diseases. Particular attention has been given to different forms of arthritis and the complications of gonorrhea. The apparatus used is the Kettering Hypertherm. The standard treatment consists of a temperature of 105 F., rectally, maintained for five hours. The air temperature of the cabinet, which is about 125 degrees F. at the start of the treatment is raised as rapidly as possible to about 150 degrees F., and the relative humidity is kept between 30 and 50 per cent. The patient's temperature rises to the desired level in from sixty to ninety minutes. In spite of various sedatives such as sodium amytal or morphine in generous doses, patients may be apprehensive, restless and uncomfortable. In many cases the continuation of the treatment depends to a considerable extent upon the ability of the nurse to entertain, distract, persuade and cajole. The skin is watched carefully for the appearance of possible burns which are most likely to appear in scars or over the bony prominances, and are more prone to occur in blondes than darker skinned individuals. When suspicious areas are noted, they are given gentle massage, cooled by rubbing with ice and protected with extra pads. Inasmuch as the skin of the toes is especially vulnerable, heavy canton flannel boots are placed over the feet before putting the patient in the cabinet. Occasionally treatments must be terminated prematurely because of blisters.

Hot air to the skin stimulates respiration to such an extent that definite alkalosis is produced, occasionally of such severity as to be accompanied by tetany. Hyperventilation is reduced when morphine is used. Tachycardia is frequently observed. Pulse rates of 180 or 200 per minute occasionally are observed for short periods when the patient is restless. A pulse rate of 160 or more lasting over half an hour usually is sufficient reason to stop treatment. On the other hand, patients are seen with a temperature over 104 degrees F. and pulse rate under 120 per minute. The blood pressure falls gradually

and at the end of the treatment may be as low as 80 mm. of mercury systolic. Because of the marked vasodilatation, the diastolic pressure becomes very low, often falling to zero and giving rise to all the peripheral signs of wide open aortic insufficiency, such as water hammer pulse, capillary pulse and the pistol shot sign over the femoral arteries. The induction of artificial fever is a firmly established therapeutic measure. The only arguments about it are those concerning the methods of its accomplishment, the diseases to be treated and the degree of benefit which may be expected from it.

Only about one-third of the patients with chronic arthritis have obtained substantial benefits such as increased comfort and greater activity. The series contains a high percentage of very severe cases and I believe the results have been better than could have been attained without fever therapy.

Hyperergic Phenomena and Histamine. K. Gotsch.

Zeit. f. klin. Med. **129**:593 (Mar. 9) 1936.

Gotsch employs the term hyperergic as equivalent to allergic in the sense of a hypersensitivity. He points out that recent studies indicate that the antigen-antibody reaction of the allergic organism is caused by a toxin. The great similarity of hyperergic manifestations, especially of anaphylaxis, with the shock produced by the injection of histamine leads to the assumption that the toxin is a histamine-like substance or actually histamine. After citing studies that proved the presence of a toxin of histamine nature in the anaphylactic shock of dogs and guinea pigs, the author reports his own studies on eighty-two persons without signs of an allergic disturbance and on forty-five allergic patients. He tested their reactivity to a weak galvanic current and to histamine. Summarizing he states that there is no definite relationship between an allergic reaction and the skin reaction to the electrical irritation, for in patients with allergy such a reaction was often absent, while it was occasionally present in persons without allergy. However, the majority of allergic patients (forty out of forty-five) manifested a hypersensitivity to insulin. Nevertheless histamine hypersensitivity is not necessarily a sign of an allergic condition, for it occurs also in persons without allergy, although it is most frequent in persons with hyperirritability of the vascular nervous system. The author points out that, in view of the fact that histamine plays a part in the majority of methods which have been recommended for nonspecific desensitization, it seems justified to try histamine in the treatment of allergic patients. He did this by administering histamine transcutaneously by means of a galvanic current of 8 milliamperes. The cathode was dipped in water and the anode in a freshly prepared histamine solution of 1:20,000 and applied to the chest or forearms. The first application lasted only five seconds, so as to avoid undesirable secondary effects. The duration and number of the later applications depended on the cutaneous reactions. In the course of the first two or three weeks the treatments were given daily as a rule, and in the following two or three weeks they were given two or three times weekly. This mode of treatment was employed in thirty-five allergic patients, (thirty with bronchial asthma, two with migraine, one with hay fever and two with mucous colitis). Of the patients with asthma, five were completely cured and sixteen were greatly improved, while in the remaining nine the treatment proved ineffective. The patients with migraine were freed from their complaints, but the patients with hay fever and colitis showed no improvement. The improvement in the successfully treated patients lasted generally from three to four months, but in three cases it lasted more than a year. The author thinks that histamine therapy could be resorted to not only in cases in which a specific desensitization is impossible (sensitivity against many antigens) but also as an adjuvant to specific desensitization. — J. A. M. A. **106**:1862 (May 23) 1936.

Shock Treated by Warmed Air. Harold H. Hitchcock, and T. Eric Raynolds.

California & West. Med. **44**:98 (Feb.) 1936.

The success of the Sweetland cast-drier in alleviating the distress of a drying cast prompted the authors to extend its use to the treatment of patients in surgical and traumatic shock, irrespective of whether or not they were provided with a cast. An early opportunity presented itself in an individual who had developed shock soon after a bone graft of the femur for an ununited compound fracture. While the other measures to combat shock were being put into operation, he was encased in a cast-drier, which, in addition to helping his rather extensive cast to dry speedily, also provided him with quick, generalized heat. This is an impotrant factor in recovery from shock.

Subsequently, the apparatus was used on various types of shock, including postpartum, postoperative, and posttraumatic shock. Its use has now been extended as a prophylaxis against shock by using the "cast-drier" whenever any reason is presented to anticipate its possibility.

Ultraviolet Spectrophotometric Studies of Human Blood Plasma. F. Lowell Dunn, and A. T. Sudman.

Arch. Path. **21**:463 (April) 1936.

There are no significant changes in the absorption spectra of untreated blood plasma in the region of from 220 to 310 millimicrons in cases of typhoid, tuberculosis, pernicious anemia, exophthalmic goiter, toxic adenoma, cholangeitis, malignant hypertension, lobar pneumonia, lymphatic leukemia, carcinoma of the stomach, syphilis or malaria. Further refinements in apparatus may record differences in the region of from 250 to 290 millimicrons.

Fever Therapy: Its Rationale in Diseases of Nervous System. Julius Wagner-Jauregg.

Edinburgh M. J. **43**:1 (Jan.) 1936.

It can be stated that in cases of malaria treatment with advantageous effect the brain parenchyma of paralytics attains a capacity to react against the syphilitic infection, which is similar to the capacity which this organ in the majority of syphlitics has in the secondary period. During the further progress of healing this capacity of resistance extends to the mesodermal tissue of the central nervous system (meninges, blood vessels), which may be concluded from the negative reactions of the special fluid. Finally, also the other tissues acquire this faculty of resistance; and the Wassermann reaction of the serum becomes negative.

There are four series of researches which prove a direct action of malaria on the brain of the paralytic. It is probable that physical methods of increasing the body temperature induce similar processes in the tissues, principally in the reticulo-endothelial system, as in the different forms of infection and fever therapy; but there exist only few researches on this subject. It is clear, however, that these methods provoke a strong polynuclear leukocytosis, as Hinsie and Blalock (1934) have shown.

Management of Patient With Essential Hypertension. Edward Weiss.

Pennsylvania M. J., **39**:315 (Feb.) 1936.

The author outlines a regime which includes such established measures as a selected diet, rest, medicinals, physical measures, and surgery. So long as the kidney function is normal, the question of diet in essential hypertension is of minimal importance. In complicated kidney conditions the restriction of proteins and salts are indicated. It is, however, important to limit the activity of the hypertensive individual not only in daily work, but also to exercise and food. The tendency for such cases to overplay, overwork and overeat is one of the great dangers which must be controlled. The rule should be a life of mental, physical and digestive rest — one of less worry and greater cheer. Drug therapy should be used with conservatism and the nitrites prescribed with caution. The tendency has been to overdose such patients with depressor drugs and has been the cause of greater harm than good. The author finds no panaceas in physical therapy. Autocondensation offers limited relief. Sweating has its dangers in complicated cases with cardiac involvement, and colonic therapy is apparently more of a suggestive therapy than a tangible asset. As to surgery, Weiss views this trend with misgiving, but regards surgery nevertheless as the most practical method. (Comment: The foregoing discussion has taken such a midground position that no satisfactory evidence is adduced from many measures that have provided palliation and long relief. What of the patient who refuses operative interference)?

Lumbosacral Strain. G. A. G. Mitchell.

Lancet **230**:5863 (Jan. 11) 1936.

The author orders during the acute stage rest in bed for 2-6 weeks, sedatives for pain, and hot fomentations or cold compresses. If the pain persists, the back is strapped with 3 inch wide adhesive plaster, one layer being applied obliquely and another vertically, from the level of the lower dorsal spine to the trochanters; anteriorly the strapping should not extend further than the lateral abdominal lines.

When the acute symptoms have subsided, local massage and other physical measures aid in the absorption of effusion, relieve discomfort and stiffness, and expedite repair. Ultraviolet radiation, radiant heat, radiotherapy, ionization, or diathermy may be employed effectively either alone or in combination. Graduated passive and active movements should be commenced in six or seven days, or earlier, and should be continued until full movements are allowed in the sitting or recumbent position by the end of 10-20 days. These movements prevent the formation of periarticular adhesions. In the severer cases the patient should be provided with a plaster jacket, or a properly fitted back brace, when he is allowed up; women prefer strong, specially made corsets. The corsets or back brace should be worn during the day for three months to allow of complete healing of ligaments. A course of remedial exercises to strengthen the back and abdominal muscles and to correct postural defects should be prescribed.

In chronic strain, rest in bed for a short period, and physical therapeutic measures are as important as in acute strain. The patient's general health should receive attention, constipation is treated, and septic foci are eradicated. Large abdominal neoplasms or cysts are removed, and obese patients should be put on a suitable diet and fitted with an abdominal support. A back brace is not always necessary or advisable, but if the pain and disability are considerable, and especially if the patient's work is arduous, there should be no hesitation in prescribing one. Faulty posture should be corrected, and if it is due to any remedial cause, such as a deformity of a lower limb, this must be treated by operation, or by a suitable orthopedic appliance.

Persistent pain and stiffness often point to adhesions interfering with the joint action or pressing on nerves or nerve endings and no amount of heat, diathermy, or ionization will affect them. Manipulation to break down the adhesions followed by careful after treatment to prevent their recurrence is the logical remedy. A general anesthetic is given, the knees and hips are acutely flexed in order to control the pelvis, an assistant steadies the shoulders, and the pelvis is moved in various directions until complete flexion, extension, lateral flexion, and rotation of the spine are produced. Before manipulation is performed recent radiograms of the lower spine must be examined to exclude other pathologic conditions.

Further Aspects of Diathermy in Ophthalmology. Grover H. Poos.

J. Missouri M. A. **33**:388 (Oct.) 1936.

The author comments on the fact that it was no surprise to observe that when diathermy was introduced into ophthalmology it was not generally accepted. The persistence of favorable reports, however, has led workers to investigate the merits of both medical and surgical diathermy. Surgical diathermy is more generally accepted by American investigators. In reviewing the literature, attention is directed to the use of electrocoagulation in certain conditions of the lids and conjunctiva, in pterygia and in trachoma. The electrosurgical treatment of pannus by a simple peritomy with the coagulation current is discussed, as is also the use of electrosurgery in the management of prolapse of the iris following injuries and operations. Blepharospasm, vitreous prolapses following separation of the wound edges after cataract extraction, and rodent ulcers have been successfully treated by electrosurgery. The electrosurgical methods of dealing with retinal detachment are reviewed in detail, with indications and contraindications. The consensus of opinion regarding this modern procedure is that it "offers a new and unparalleled future for the cause of retinal detachment if the operation is done with precision and the case is carefully studied before the operation is undertaken." There is a growing place which diathermy is coming to occupy in the treatment of eye diseases and the study and investigation which is being made by conservative, scientific men. Further experience with electrosurgery is necessary before definite conclusions can be drawn. The results thus far obtained merit continued experimentation and it seems destined to play a significant part in ophthalmology.

Effects of Hyperpyrexia on Human Blood Count Blood Chemistry and Urine. John F. Simon.

J. Lab. & Clin. Med. **21**:4 (Jan.) 1936.

Production of fever was accomplished by use of a standard hyperpyrexator cabinet, using resistance coils to furnish heat and employing no fans or circulating devices. It was therefore a production of fever by contact of heated air with the body surface. Seventy-one treatments of ten patients have been studied for some of the commoner changes in the blood count, urine, and blood chemistry. During treatment, the blood is at first diluted, but later becomes concentrated. The urine shows an increasing alkalinity and occasionally clearing of albuminuria. The blood sugar level shows a marked rise, with no glycosuria when the level reaches to the accepted renal threshold or beyond. Creatinine and nonprotein nitrogen show more of an increase than can be considered due to concentration. Blood chlorides descrease approximately 2 per cent. The white blood count is increased by fever treatments. This is first noticed in the granulocytes, and is due partly to production of immature forms and partly to mobilization of older types.

Radium Treatment by Lesions About the Head, Face and Neck. William H. Kennedy.

J. Indiana S. M. A. **29**:513 (Oct.) 1936.

The author's summary is as follows:

From the topographic standpoint, the head, face and neck with their broken contours and multiplicity of divergent planes, present a field demanding great adaptability in any agent for local therapy. The various technics of radium application meet this demand in a satisfactory manner.

From the anatomic standpoint, this field, in which important organs of small dimensions are brought together in close proximity, is peculiarly suitable for radium therapy, because with radium it is possible to concentrate the radiations in very small areas, and, with the variety of technics that are available, to obtain maximum results in the lesion with the minimum risk of damage to adjacent structures.

From the histologic standpoint, malignant tumors in this field are favorable objects for radium therapy, because with few exceptions their cells are radiosensitive.

The great majority of tumors in this field are conveniently accessible for interstitial irradiation.

Radium is the method of choice for nearly all malignant tumors in the field and for many nonmalignant tumors, precancerous lesions of the skin and mucous membranes, and circumscribed dermatoses, especially when these are localized to the eyelid, nose and region of the ear. The cosmetic results of treatment are of peculiar importance in this field. The cosmetic results after radium treatment are far superior to those after surgery and are frequently superior to those after application of x-rays. The radium scar is soft, elastic and often invisible.

Fever Therapy in Ocular Manifestations of Syphilis. Albert N. Lemoine.

J. Oklahoma S. M. A. **29**:309 (Sept.) 1936.

Through the centuries repeated references were made to the cases of general paresis that had been favorably affected by intercurrent fevers. However, fever therapy was not revived until 1918, but since that time the induction of fever has been accepted as an extremely valuable measure in the treatment of these cases. The fact that the malarial paroxysms acted so favorably on paralytic patients stimulated many investigators to attempt to produce hyperpyrexia by other means. Based on animal experimentation, investigators were prompted to use hot baths in the treatment of syphilis of the central nervous system in human beings. After further experiments on animals and humans, diathermy was introduced for the production of fever.

Lemoine's first attempt with fever therapy, in the absence of physical means, was with inoculation with malarial parasites. In this series there were patients with interstitial keratitis, optic neuritis, and primary and secondary optic atrophy. The technic of treatment both with tertian malarial parasites and with hot baths is given. Pa-

tients treated by fever therapy should be given an intensive course of chemotherapy two months after termination of the fever therapy. Statistics of cases treated by both methods, i. e., malaria and diathermy are given. In conclusion the author states:

Fever therapy relieves the symptoms and obliterates the vessels in the cornea in interstitial keratitis more rapidly than any other treatment.

Syphilitic optic neuritis improves more rapidly by fever therapy than by any other form of treatment.

Apparently fever therapy arrests the progress of primary optic atrophy and in some cases even improves the vision and the fields, at least temporarily.

Use of Short Wave in Treatment of Vascular Diseases. H. Dausset and C. A. Arraud.

Rev. méd. franç. **17**:315 (April) 1936.

The authors outline their methods in the treatment of several groups of diseases of the cardiovascular system. For cases of angina pectoris and anginoid syndrome without heart failure, they advise a course of 12 exposures on alternate days for approximately 15 minutes, depending upon individual tolerance, with electrodes of 15 cm. diameter placed in front of and behind the region of the base of the heart. Unless there is some relief of pain after the first few treatments, it is useless to continue. In successful cases, symptomatic relief lasted from three months to two years. In hypertension, diathermy was found more efficient than short wave. Only functional or psychogenic hypertension was helped. The authors attribute an alleged sedation in vascular spasm to the increase in metabolism, diuresis, hepatic and endocrine function, when short wave is given to large areas. Arteritis was found to respond more favorably to short wave than to diathermy. The electrodes are placed parallel to the extremities, or one large plate under the back and two others to the soles of the feet. The intensity of the current is raised to the point of comfortable heat, and given for 30 minutes every other day for three months. For vascular pathology in the brain, a transcerebral radiation is given for 20 minutes, every other day for four to six weeks. The ease of application in this area is stressed. A current of 200 watts is recommended. In acrocyanosis, the patient is placed between two large plates of a more powerful generator, and the intensity is so regulated, that the rectal temperature does not exceed 38 degrees C. Periphlebitis, which is hardly affected by diathermy, responds to short wave. The electrodes are placed along the sides of the extremity and a comfortable warmth is administered for 30 minutes on alternate days. If the intensity of current is too great, cramps will be experienced. Short wave is found superior to diathermy in the treatment of varicose ulcers and Raynaud's disease. The authors conclude that short wave is superior to diathermy, in the treatment of almost all vascular disturbances where heat is indicated.

Electrocoagulation of Plantar Wart. M. Ducourtioux.

Rev. méd. franç. **17**:31 (January) 1936.

When the common wart appears on the sole of the foot its appearance is different from that in any other part of the body because the epidermis in that situation is so thick that the wart fails to exteriorize. The continual pressure trauma of walking excites pain. At first the patient thinks he has a corn and exercises the usual home remedies. The pain becomes progressive, and when the patient finally consults the physician, this history should make him think of plantar wart. Examination will reveal a growth resembling a corn but perforated by several minute circumscribed orifices. A tiny opaque point under the cornified area will give exquisite pain on gentle pressure, and such a tender point is pathognomonic. Pare the horny tissue with a scalpel, and inject novocaine through a fine needle, which should be introduced into the surrounding healthy tissue obliquely, so that the tip will reach just under the wart. Introduce a needle electrode into the wart and apply a coagulating current of low intensity until there is a change of color and tissue retraction. Remove the destroyed tissue with a pair of curved scissors, and lightly coagulate the underlying tissue to insure destruction of the wart. The author compares this method with others and finds that x-ray and radium are effective but too radical for such pathology; taht cryotherapy is too painful and prolonged; that excision is accompanied with the inconvenience of dressings and scars with occasional recurrences in the line of the scar. He concludes that electrocoagulation is the best method for treating plantar wart.

Structure of Ultraviolet Absorption Spectra of Certain Proteins and Amino Acids. Calvin B. Coulter; Florence M. Stone, and Elvin A. Kabat.

J. Gen. Physiol. **19**:739 (May 1) 1936.

The absorption spectra of a number of proteins in the region 2500 to 3000 A. have been found to comprise from six to nine narrow bands. In consequence of variation in the relative intensity of these bands from protein to protein, the absorption curve has a characteristic configuration for each protein. These bands correspond closely in position with the narrow bands which appear in the absorption spectra of tryptophan, tyrosin, and phenylalanine. Tryptophan and tyrosine each present three bands, phenylalanine shows nine. The bands in the proteins are accordingly attributed to these amino acids. In the proteins the bands are displaced from the positions which they occupy in the uncombined amino acids, in most instances, by 10 to 35 A. toward longer wavelengths. The absorption spectrum of Pneumococcus Type I antibody resembles that of normal pseudoglobulin but shows characteristic differences.